Honeywell

BENDIX/KING®

KMD 250

Multi-Function Display/GPS

Pilot's Guide

Covered by US Pat. 6512975

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**KMD 250 Multi-Function Display
and
KMD 250 Multi-Function Display with GPS**

Software Version 02/01 or later

Revision History and Instructions

Manual   KMD 250 Pilot's Guide

Revision   4, August 2007

Part Number   006-18281-0000

Summary

S/W 02/01: Added XM functionality to the KMD 250

Revision History and Instructions

Manual   KMD 250 Pilot's Guide

Revision   3, December 2005

Part Number   006-18281-0000

Summary

S/W 01/08: Added Airport Type on Airport Info Screen on page 1-25

Added TIS patent statement on inside front cover.

Changed Awareness to Avoidance on page 1-1.

Changed 100L to 100LL on page 1-27.

Added Definition for Heading on TIS screen on page 3-12.

Corrections to Index pages I-1 and I-12.

Revision History and Instructions

Manual   KMD 250 Pilot's Guide

Revision   2, April 2004

Part Number   006-18281-0000

Summary
Added:
Internal GPS
Flight planning capability
Nearest function
User Waypoints
Direct-To function
Quick Tuning capability
Airspace Alerting
Airspace depiction
Waypoint Alerting
Turn Anticipation

Revision History and Instructions

Manual   KMD 250 Pilot's Guide

Revision   1, November 2003

Part Number   006-18281-0000

Summary

Change in text on Startup Caution Page.

Revision History and Instructions

Manual   KMD 250 Pilot's Guide

Revision   0, November 2003

Part Number   006-18281-0000

Summary

This is the original release of this publication.

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SECTION 1
BASIC KMD 250 OPERATION

INTRODUCTION

All of us at Honeywell congratulate you on choosing this product. You are now the owner of one of the most sophisticated yet simple-to-use multifunction displays available today. We understand you probably can't wait to see it in action but before you try to use it do please take the time to read through this manual and understand its many interesting and useful features. Time spent in familiarizing yourself with your new KMD 250 unit will be more than repaid by trouble-free operation later, and more importantly safe and accurate navigation.

We have made the operation of this unit as intuitive as possible through the use of Softkeys, menus, and on-screen help, thus reducing pilots' dependence on the manual. You should very quickly find that handling it efficiently and expertly becomes second nature to you. Don't be afraid to experiment.

We thank you for your decision to purchase a KMD 250 and wish you many happy and safe hours flying.

The KMD 250 MFD is a panel mounted Multi-Function Display system that is available with an optional internal VFR GPS navigator. The KMD 250 is a component of the Bendix/King Integrated Hazard Avoidance System (IHAS) family of products that are designed to improve the pilot's ability to manage four major safety hazards: situational awareness (moving maps), weather, traffic, and terrain avoidance.

The KMD 250 features a 3.8 inch diagonal color LCD display. It includes a high capacity data card for storing Jeppesen aviation data as well as cartographic map data including terrain elevation, roads, lakes, rivers, railroads, obstacles, political boundaries, cities, and urban areas. The card is updated on a 28 day cycle. Application software is also included on this card.

The KMD 250 is available in two versions. One version has an internal GPS and the other requires GPS information from an external source, such as the KLN 94. The internal GPS is certified only for VFR operations. The functions of both versions will be discussed in this pilot's guide. Functions that are related to the use of the optional internal GPS are marked with this 🌐 symbol.

The KMD 250 performs the following functions:

- Configurable Moving Map Display with aeronautical and cartographic database

- User Entered Waypoints

- Flight Planning and Direct-To

- Terrain awareness display (Terrain color coded by relative altitude)

- FIS weather data display and overlays

- TCAS/TAS/TIS traffic display and overlay

- L-3 WX-500 Stormscope® display and overlay

This Pilot's Guide is divided into five sections and four appendices. Each section addresses a specific function as follows:

Section 1	Basic KMD 250 Operation	Explains the use of the Map Display, Flight Planning, Joystick, Functions Keys, Softkeys and Rotary Knob.
Section 2	FIS VDL or XM Operation	Explains the operation of the Flight Information Services VHF Datalink (VDL) or XM weather products.
Section 3	Traffic Avoidance System Operation	Explains operation of TCAS I, TCAS II and TIS systems as they pertain to the KMD 250. Refer to the TCAS I or TCAS II user's manual for more information.
Section 4	WX-500 Stormscope® Operation	Explains operation of the Stormscope® as it pertains to the KMD 250. Refer to the Stormscope® user's manual for more information.
Section 5	System Messages	Explains accessing and the meaning of system messages that may be presented by the various systems.
Appendix A	Definitions, Acronyms, Abbreviations	Explains various terms and abbreviations.
Appendix B	Common Weather Abbreviations	Explains weather abbreviations commonly seen in aviation weather reports.
Appendix C	GPS Primer	An overview of how GPS works.
Appendix D	Navigation Terms	Definitions and examples of common navigation terms.

GENERAL INFORMATION

This portion of the manual provides an overview of the user interface controls and display presentation of the KMD 250 Multifunction Display.

This manual also provides an explanation of each of the individual displays that the KMD 250 unit presents.

The operating system of the Bendix/King KMD 250 keeps to a minimum the number of key presses necessary to activate the various functions, especially those most frequently used in the air. The provision of a joystick makes it considerably easier to operate the unit and allows for fast and efficient access to most functions.
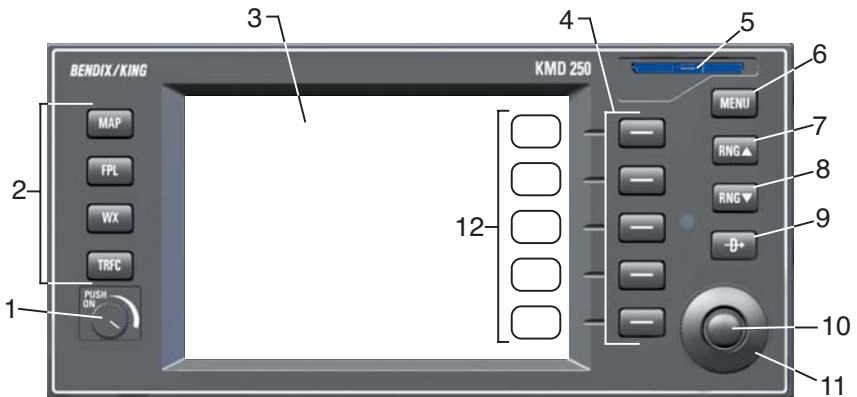
1. On/Off/Brightness Control

2. Function Select Keys

3. Display

4. Softkeys

5. Data Card

6. Menu Key

7. Range Up Key

8. Range Down Key

9. Direct-To Key
   NRST (Nearest) Key

10. Joystick

11. Rotary Knob

12. Softkey Labels

FUNCTION SELECT KEYS

These keys are used to select available data sources (as indicated on the key) for display on the LCD. Pressing the same Function Select Key multiple times will sequence through the available pages associated with that function. The following diagram shows the available pages under each function. Note that not all pages will be available in all installations.

MAP	FPL	WX	TRFC
VFR Map (Absolute Terrain)	Active Flightplan	Datalink Wx Graphical Products	TAS/TCAS/TIS
IFR Map (No Terrain)	Flightplan Index 🌐	Datalink Wx Textual Products	
Relative Terrain Map		Stormscope®	
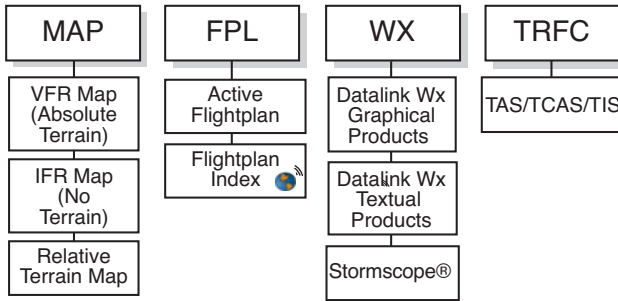
MENU KEY

Displays the available Softkey options for the currently selected function.

RANGE KEYS

RNGΔ- Pressing this key will increase the range scale one level on the displayed page. Range scales on other pages will not be affected.

RNG∇- Pressing this key will decrease the range scale one level on the displayed page. Range scales on other pages will not be affected.

DIRECT-TO/NRST (NEAREST) KEY

The Direct-To Key (⏱) is found on units containing the optional internal VFR GPS navigator. When pressed the Direct-To function is initiated. Direct-To will only function when the internal GPS is selected as the current navigation source.

The NRST (Nearest) Key is found on units without the internal GPS option. When pressed the Find Nearest Window will be displayed.

SOFTKEYS

When active, the description indicated in the label describes the key's present function related to the displayed page. Whenever a new option is selected, a new display is shown along with its new key labels. This

capability of displaying operations that are only applicable to a particular screen is referred to as 'Soft Keying', and allows one key to perform multiple functions without the complications of multiple key presses on a conventional keypad.

JOYSTICK

This is a pointing device which moves a mouse-like pointer around the display. It is primarily used for pointing at items on the map for further information and for measuring range and bearing to specific points. It is also used to move through menu lists.

ROTARY KNOB

The Rotary Knob, located in the lower right of the unit, has various functions as indicated by a soft label when active. It is also used to move through menu lists and change data within data fields.

STORMSCOPE® OPTION

The KMD 250 has the ability to interface and control an L-3 WX-500 Stormscope® 'black box' thunderstorm sensor. When the Stormscope® interface is on and the overlay is enabled, lightning icons will also appear on the display.

DEMO MODE

The Demo Mode can be used to practice using the KMD 250. This will allow you to utilize it to the maximum extent.

When the KMD 250 is in the Demo Mode, it performs as if it is receiving adequate sensor signals to use the various functions. See DEMO MODE & SETUP later in this section.

FUNCTION STATUS ICONS

The Function Status Icons are used to show the current status of Traffic Avoidance, Flight Information Services Weather Products and WX-500 Stormscope® functions. These icons are displayed in the lower left of the screen. If a function is not enabled, or is not installed, that function's icon will not be displayed.

In general, if a Status Icon has a gray background the function is not being displayed on the current display. This may be due to the setting on the Map Setup Overlays Group Page. If the map display range is beyond that set on the Map Setup Overlays Group Page, then the Status

Icon background will be gray because that function will not be displayed at that range setting.

If a Status Icon has a light blue (cyan) background the function is currently being displayed. This does not necessarily mean that data is visible because there may be nothing to view.

For example, if traffic icons are set to display at 30nm on the Map Setup Overlays Group Page and the VFR Map range is increased to beyond 30nm, then traffic will no longer be overlayed on the VFR Map display and the traffic Status Icon background will change from light blue to gray.

The following table illustrates the Function Status Icons and their meanings in more detail.

Icon	Colors	Description
	Black on cyan	Traffic sensor in standby mode being displayed.
	Black on cyan	Active traffic information being displayed.
	Black on gray	Traffic sensor in standby mode, not being displayed.
	Black on gray	Traffic sensor active, not being displayed.
	Black on yellow	TIS service not available.
	Flashing black on yellow	A Traffic Advisory (TA) alert is active. The icon will be flashing.
	Flashing black on red	A Resolution Advisory (RA) alert is active. The icon will be flashing.
	Black on gray with red slash	Traffic sensor data invalid / not being displayed.
	Black on cyan	Stormscope® information being received and displayed.<MODE> is either STRK (Strike) or CELL depending on mode selected on Stormscope® page.
	Yellow on cyan	Stormscope® information being received and displayed. Strikes have occurred within 25 nm.
	Black on gray	Stormscope® information being received but not displayed.
	Yellow on gray	Stormscope® information being received but not displayed. Strikes have occurred within 25 nm.
	Black on gray with red slash	Stormscope® information not being received; data is invalid.

VDL Icon	XM Icon	Colors	Description
		Black on a cyan background.	No weather data is currently being received but previously received data is being displayed on the present page.
		Black on a cyan background.	Weather data is currently being received from a signal and displayed on the present page. XM signal is weak.
		Black on a cyan background.	Weather data is currently being received from a signal and displayed on the present page. XM signal is marginal.
		Black on a cyan background.	Weather data is currently being received from a signal and displayed on the present page. XM signal is good.
		Black on gray.	Weather data not being received nor displayed on the present page.
		Black on gray.	Weather data is currently being received from a signal but not displayed on the present page.
		Black on gray with red slash	Fault with connection or data link radio.

STARTUP DISPLAYS

At power-up, the startup logo displays will be seen.

If Stormscope® is installed with the system, a display similar to the one at the right will be seen.

After the completion of the Self Test, press the **OK** Softkey.
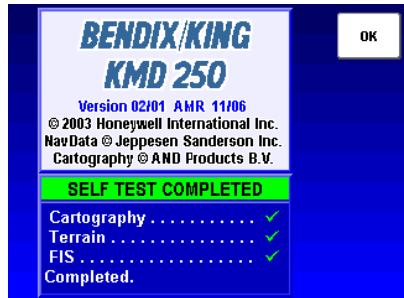
One of the following Instrument Panel Self Test Pages will be displayed depending on whether the unit is equipped with an internal GPS or is the non-GPS version.
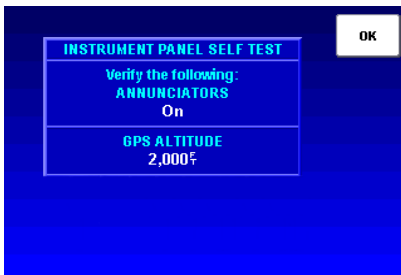
Non-GPS KMD 250
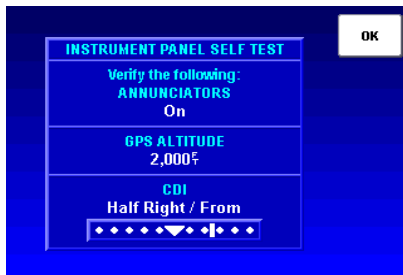
KMD 250 with Internal GPS

Verify that the Message and Waypoint Alert annunciator lamps are on. These annunciators are external to the KMD 250, mounted elsewhere on the instrument panel as shown here represented as **MSG** and **WPT**. However, they are optional and may not be installed. Verify the **GPS ALTITUDE** (BARO ALTI-TUDE will be displayed if the system is configured to use a baro-metric altitude source) is consistent with the altimeter. If the KMD 250 is configured to use the optional internal GPS as "sole source" or "backup" verify the Course Deviation Indicator (**CDI**) is showing half scale right deflection with a FROM indication. If all is correct after verification, press the **OK** Softkey.
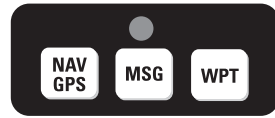
Typical External Annunciator Unit

One of the following caution screens will now be displayed depending on whether the unit is the non-GPS version or the unit is equipped with the internal GPS . Acknowledge by pressing the **OK** Softkey.
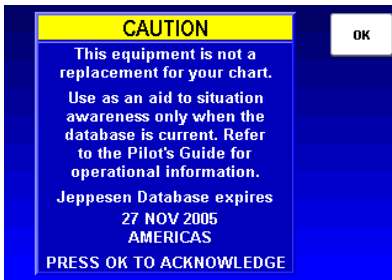
Non-GPS KMD 250
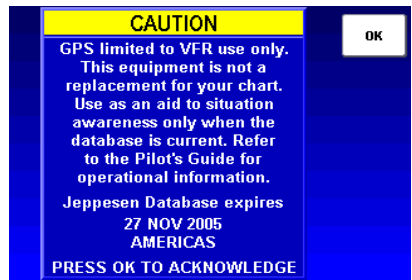
KMD 250 with Internal GPS

Acknowledge the next caution page by pressing the **OK** Softkey.
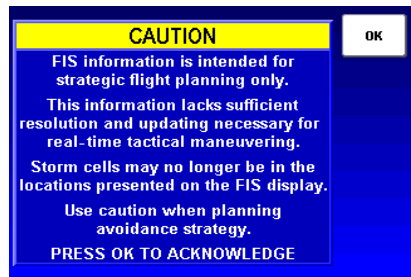
The KMD 250 is now ready for use and will be showing the VFR Map Display.
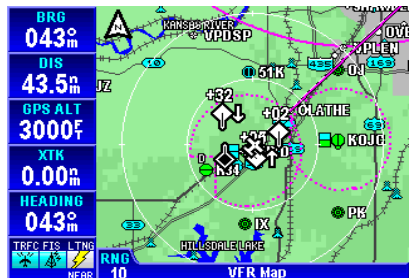
POP-UP HELP DISPLAYS

Pop-up status displays are shown if a Function Select Key is pressed and held for longer than 2 seconds. These can help provide a reference for monitoring the status of selected functions. The first example is a **MAP** Function Select Key pop-up. Second is the pop-up displayed when pressing and holding the **WX** Function Select Key.

Map Display Pop-Up Help
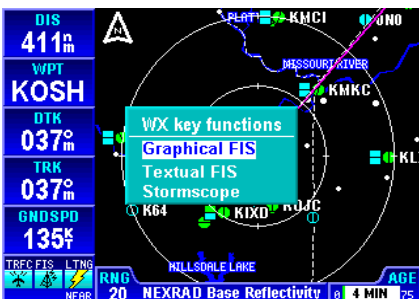
Weather Display Pop-Up Help

POWER DOWN

When power is turned off a display similar to that shown here will be seen. The system will shut down in 5 seconds. This allows for inadvertently turning off the system. Push the ON/OFF/Brightness Control back in before the countdown is over and the system will continue where it left off with no loss of data.
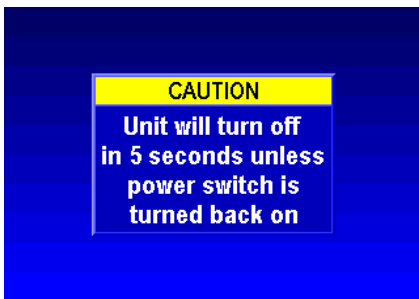
Power Down Display

DATA FIELDS

Data Fields may be used to display various types of information in windows on the left side of the screen, as shown here. This makes it easy to get quick access to desired information.

The Data Fields can be turned on or off and customized separately in each of the **MAP**, **WX** or **TRFC** Displays. The system will remember the last selected parameters in each function display and will maintain this configuration until changed.
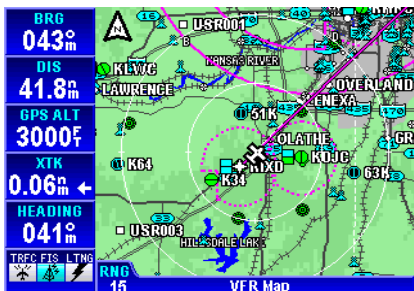
Map Display-Data Fields On
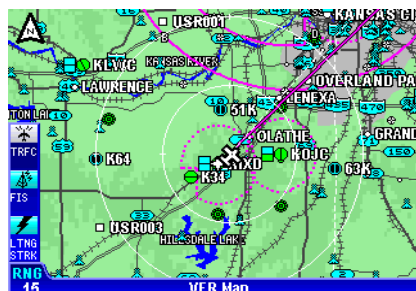
Map Display-Data Fields Off

Each field can be customized to display any of the following:

ALT	Altitude
BRG	Bearing to Waypoint
CDI	Course Deviation Indicator
DIS	Distance to Waypoint
DEP TIME	Departure Time
DTK	Desired Track
ESA	En Route Safe Altitude
ETA WPT	Estimated Time of Arrival at Waypoint
ETE WPT	Estimated Time Enroute to Waypoint
FLT TIME	Flight Time
GNDSPD	Ground Speed
HEADING	Heading
MSA	Minimum Safe Altitude
NEAR POS	Near Position Display
PPOS	Present Position
TIME	Time
TKE	Track Angle Error
TRFC	Traffic
TRK	Actual Track
WPT	Active Waypoint
XTK	Cross Track Error

NOTE: Some fields may not have valid data depending on the installation.

The CDI (Course Deviation Indicator) Display has scaling of 5nm, 1nm and .3nm depending on the setting on the Navigation Setup Page (see Navigation Setup in this section).

The Near Position (NEAR POS) display is intended to provide an easy method of reporting aircraft position to Air Traffic Control. This is done by always displaying the nearest reporting position to the aircraft's present position in the Data Field. The position criteria can be set to display the nearest VORs, VORs plus airports or all data (airports, VORs, VOR/DME, VORTAC, NDB, VRP). Settings are made on the Navigation Setup Page discussed later in this section.

To turn the Data Fields on or off, perform the follow steps:

1. Press the **MENU** Key to display Figure 1-1.

2. Press the **CHANGE FIELDS** Softkey to display Figure 1-2. If the Data Fields were on to begin with, a **FIELDS OFF** Softkey will be available. If the Data Fields were off, a **FIELDS ON** Softkey will be available. Pressing this Softkey will toggle the Data Fields on and off.

3. When finished press the **DONE** Softkey.

To change Data Fields, perform the follow steps:

1. Perform steps 1 and 2 above. With the Data Fields turned on, use the Joystick to select the desired Data Field as shown in Figure 1-3. In this case the top Data Field is selected and displays **BRG** as indicated in the list.

2. When the desired Data Field is selected, use the Rotary Knob to select data from the list to be displayed in that Data Field.

These settings will be maintained until changed by the user.

3. When finished press the **DONE** Softkey.

Figure 1-1

Figure 1-2

Figure 1-3

Pressing the **RESTORE DEFAULT** Softkey will reset the Data Fields back to the factory settings.
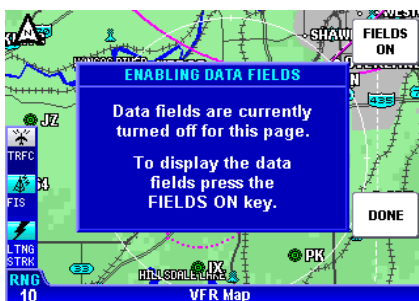
COURSE DEVIATION INDICATOR (CDI)

A Course Deviation Indicator (CDI) graphically displays left and right deviation from a desired course. A CDI can be displayed in any of the Data Fields as shown in Figure 1-4. The CDI's vertical bar operates like a navigation deviation needle on a conventional CDI or HSI using VOR/Localizer navigation. An on-course indication is displayed when the vertical deviation bar is centered on the triangle in the middle of the CDI. In enroute use, each dot represents one nautical mile deviation from the desired track (full scale deviation is ± 5 NM). Different CDI scales can be set on the Navigation Setup Page. A vertical deviation bar positioned two dots to the right of the center triangle indicates the aircraft is two nautical miles to the left of course as shown in Figure 1-5. The center triangle also serves as the CDI's TO/FROM indicator and operates in the same manner as a conventional CDI TO/FROM indicator; a triangle pointing up indicates "to" the active waypoint while a "down" triangle (Figure 1-6) indicates "from" the active waypoint. The word **FLAG** is displayed over the CDI when the CDI is not usable for navigation as seen in Figure 1-7.
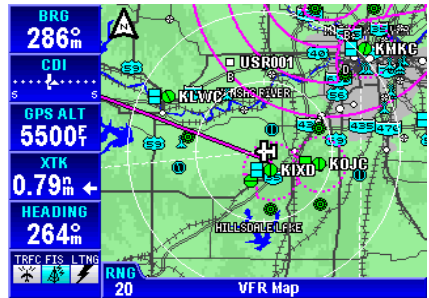
Figure 1-4
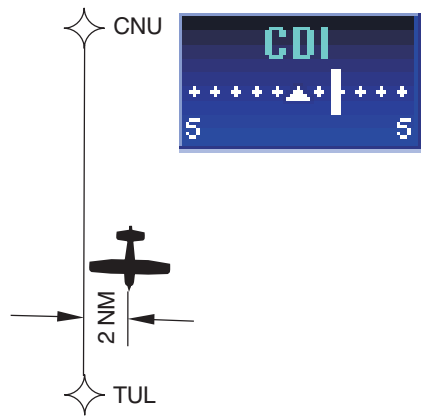
Figure 1-5

Figure 1-6

Figure 1-7

GREAT CIRCLE COURSES AND MAGNETIC VARIATION 🌐

Due to "great circle" courses and magnetic variation differences between present position and the active waypoint, the To bearing and From radial may not be exactly 180° different from each other. This condition is most likely to occur when long distances are involved, and/or you are operating in very northerly or southerly latitudes.
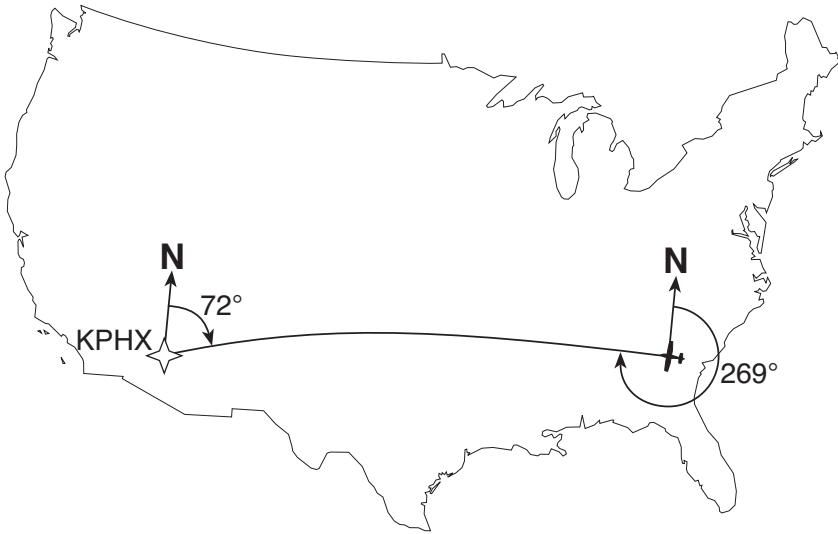
Figure 1-8

See Figure 1-8 for an example depicting a case like this. The aircraft is somewhere over Georgia, and the active waypoint is KPHX. The bearing to steer is 269°, and radial is 72°. Generally, bearing (not radial) will be used when long distances are involved.

MINIMUM AND ENROUTE SAFE ALTITUDE

The Minimum Safe Altitude (MSA) displayed is the altitude defined by Jeppesen as "Grid Minimum Off-Route Altitude (Grid MORA)". This altitude is derived by Jeppesen for sectors which are one degree of latitude by one degree of longitude in size. One degree of latitude is 60 nautical miles. One degree of longitude is 60 nautical miles at the equator and progressively less than 60 nautical miles as one travels away from the equator. One degree of longitude is approximately 50 nautical miles at the southern most parts of the U.S. and is approximately 40 nautical miles at the northern most parts of the U.S. The MSA altitude information is contained in the database and is updated when the datacard is updated.

The MSA provides "reference point" clearance within these one degree latitude by one degree longitude sectors. Jeppesen defines a reference point as "a natural (Peak, Knoll, Hill, etc.) or man-made (Tower, Stack, Tank, Building, etc.) object". Jeppesen states the following about the Grid Minimum Off-Route altitude: "Grid MORA values clear all reference points by 1000 feet in areas where the highest reference points are 5000 feet MSL or lower. MORA values clear all reference points by 2000 feet in areas where the highest reference points are 5001 feet MSL or higher". The KMD 250 displays dashes for areas outside the database coverage area or for areas where the Grid MORA is not defined.

The Enroute Safe Altitude (ESA) is the highest MSA sector altitude from the present position to the active waypoint, then to the destination waypoint along the active flight plan. See Figure 1-9. When the KMD 250 is in the OBS Course Mode, the minimum en route safe altitude is the highest MSA sector altitude from the present position to the active waypoint.
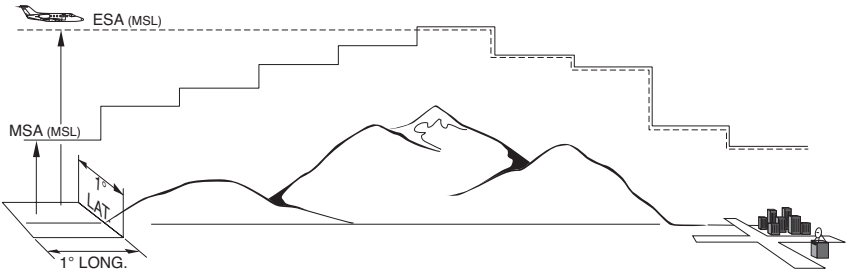
Figure 1-9

CAUTION

The MSA and ESA altitudes displayed are advisory only. They should not be relied upon as the sole source of obstacle and terrain avoidance information. Refer to current aeronautical charts for appropriate minimum clearance altitudes.

INTERNAL GPS STATUS 🌐

For an overview on how the Global Positioning System works, refer to Appendix C, GPS Primer.

Such parameters as present position, altitude, date, time, satellite state, DOP, satellites tracked, signal strength and elevation for the internal GPS can be monitored on the Internal GPS Status Page. To access this page perform the following:

1. Press the **MENU** Key to display Figure 1-10.

2. Press the **AUX MENU** Softkey to display Figure 1-11.

3. Using the Rotary Knob or the Joystick to select **Internal GPS Status** as shown in Figure 1-11.

4. Press the **SELECT** Softkey to display Figure 1-12.

5. Press the **RCVR INFO** Softkey to view information such as the GPS receiver software part number, software version, software revision and serial number as shown in Figure 1-13.
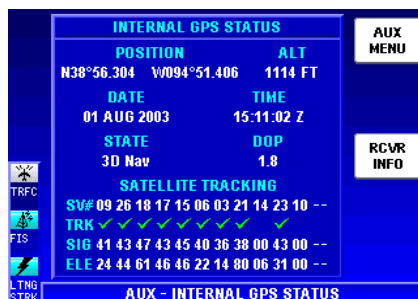
QUICKTUNE™

The KMD 250 is capable of tuning the KX 155A/165A Nav/Comm. The KMD 250 is capable of tuning up to four Nav/Comm systems, depending on the installation. Use of this feature will be discussed later in Map Operation and Flight Planning.

Figure 1-10

Figure 1-11
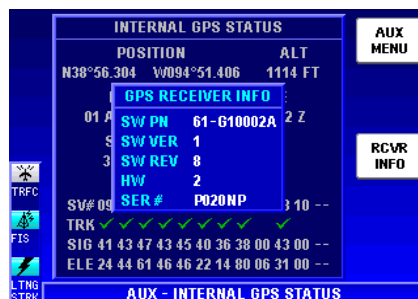
Figure 1-12

Figure 1-13

MAP OPERATION

The following illustration describes the data that appears on the Map Display.
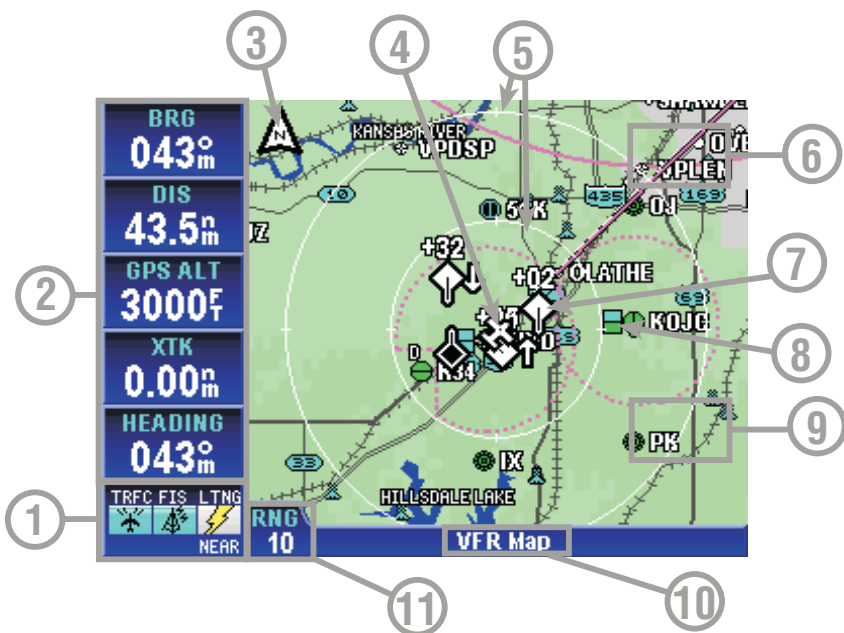
1 **Function Status Icons** - Displays icons representing data available and displayed as well as sensor status.

2 **Data Fields** - These can be turned on or off. Each of the 5 windows can be set to display one of the following; **ALT, BRG, CDI, DIS, DEP TIME, DTK, ESA, ETA WPT, ETE WPT, FLT TIME, GNDSPD, HEADING, MSA, NEAR POS, PPOS, TIME, TKE, TRFC, TRK, WPT, XTK**.

3 **North Pointer**

4 **Aircraft Symbol** - Indicates present position. Stylized airplane when heading or track input is present, a plus symbol with no heading or track.

5 **Range Rings** - Outer ring radius is selected range, inner ring radius is one half the selected range.

6 **RESET STICK Soft Label**

7 **Traffic Symbol Overlay** - Displayed when traffic avoidance system is installed.

8 **Graphical METAR Icon Overlay** - Displayed when FIS is installed and subscription is valid.

9 **LEGEND Soft Label**

10 **Current MAP Selection** - **VFR MAP** (absolute altitude terrain shading), **IFR MAP** (no terrain shading) or **Relative Terrain Map** (relative altitude terrain shading).

11 **Display Range** - **RNG:####**.

SELECTING A MAP DISPLAY

Press the **MAP** Function Select Key to sequence through the VFR Map, IFR Map and Relative Terrain Map Display. With the IFR Map displayed, no topographic data is displayed. With the Relative Terrain Map displayed, topographic data is displayed as colors corresponding to elevation relative to the aircraft's present altitude. See Tables 1-1 and 1-2 on Absolute and Relative Altitudes.
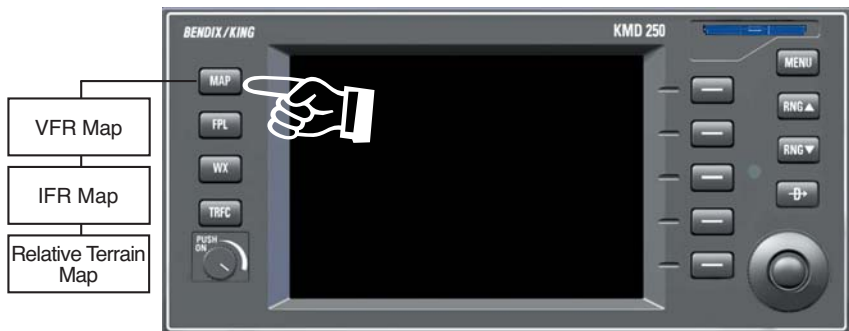
VFR MAP

With the VFR Map displayed, topographic data is displayed as colors corresponding to the absolute altitude stored in the database (see Figure 1-14).

The VFR Map displays terrain similar to a VFR sectional chart. Table 1-1 shows the levels and terrain shading used on the VFR Map.

A color key can be displayed by moving the Joystick Pointer pressing the **LEGEND** Softkey as shown in Figure 1-15. To exit, press the **CLEAR** Softkey then press the **RESET STICK** Softkey.
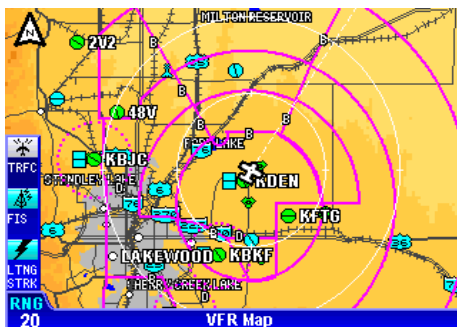
Figure 1-14 - VFR Map
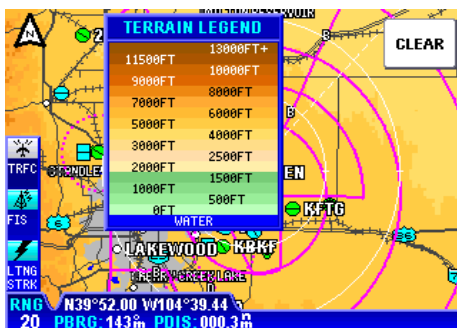
*Figure 1-15
Absolute Terrain Color Key*

Absolute Terrain Altitude (feet)	Color
13000+	Dark Brown
11500-12999	⇓
10000-11499	⇓
9000-9999	⇓
8000-8999	⇓
7000-7999	Light Brown
6000-6999	Dark Tan
5000-5999	⇓
4000-4999	⇓
3000-3999	⇓
2500-2999	⇓
2000-2499	Light Tan
1500-1999	Dark Green
1000-1499	⇓
500-999	⇓
<499	Light Green
Water	Blue

Table 1-1   Absolute Terrain (VFR Map)

IFR MAP

Terrain is not displayed on the IFR Map display as shown in Figure 1-16. In addition, all built up or urban areas are shaded light gray. Oceans, rivers and lakes are blue.

RELATIVE TERRAIN MAP

With Relative Terrain Map displayed, topographic data and obstructions are displayed as colors corresponding to elevation relative to the aircraft's present altitude as shown in Figure 1-17. This feature is useful in providing awareness to possible terrain hazards at the present aircraft altitude. Table 1-2 shows the levels and terrain shading used on the Relative Terrain Map.

Figure 1-16 - IFR Map
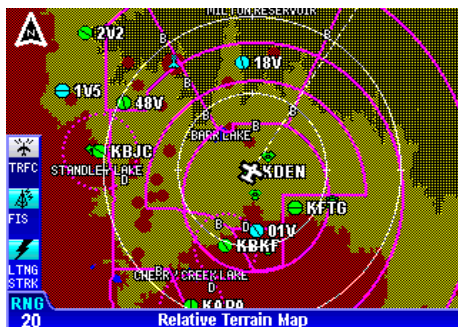
Figure 1-17 - Relative Terrain Map

Aircraft Altitude Relative to Terrain (feet)	Aircraft Altitude Relative to Obstacle (feet)	Color
250 ft. or more below surrounding terrain	250 ft. or less above obstacle	
Between 249 ft. below & 250 ft. above surrounding terrain	Between 251 ft. & 750 ft. above obstacle	
Between 251 ft. & 750 ft. above surrounding terrain	Between 751 ft. & 1250 ft. above obstacle	
Between 751 ft. & 1250 ft. above surrounding terrain	Between 1251 ft. & 1750 ft. above obstacle	
Between 1251 ft. & 2000 ft. above surrounding terrain	Between 1751 ft. & 2000 ft. above obstacle	
2001 ft. or more above surrounding terrain	2001 ft. or more above obstacle	

Table 1-2   Relative Terrain and Obstacles (Relative Terrain Map)
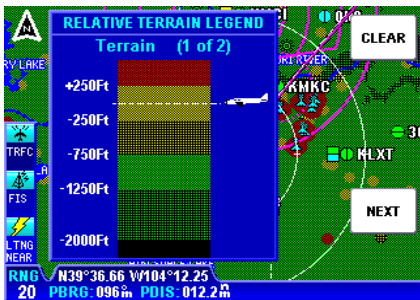
Figure 1-18
Relative Terrain Color Key
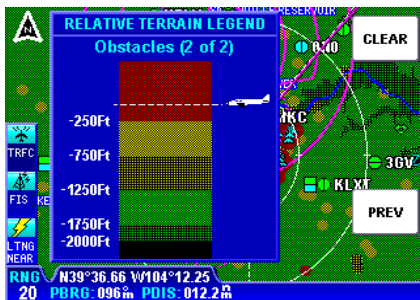
Figure 1-19
Relative Obstacle Color Key

A color key can be displayed by moving the Joystick Pointer and pressing the **LEGEND** Softkey. Notice there are two legends when viewing the Relative Terrain Map Display. The first page shows the color key for terrain (Figure 1-18) and the second (Figure 1-19) shows the color key for obstacles. The airplane icon conveys what colors would be below current aircraft altitude and what would be above. The airplane icon itself,

Figure 1-20

however, does not represent current aircraft altitude. Press the **NEXT** and **PREV** Softkeys to toggle between the two displays. To exit, press the **CLEAR** Softkey then press the **RESET STICK** Softkey.

Figure 1-20 depicts obstacles displayed on the Relative Terrain Map. Note the differences in color between terrain and obstacles based on an aircraft altitude of 2,000 ft MSL. Obstacles are enhanced on the Relative

Terrain display to provide situational awareness by displaying a 1/2 nm ring around the obstacle. For example, the obstacles displayed with a red ring, as shown in Figure 1-20, are easily identifiable and are within 250 ft. of the present aircraft altitude.

NOTE: The color scale for obstacles is more severe than terrain so that they stand out on the map.

<div style="background:yellow">

CAUTION

NEVER USE THE TOPOGRAPHIC ELEVATION DISPLAYED ON THIS EQUIPMENT AS YOUR SOLE REFERENCE FOR TERRAIN AVOIDANCE.

</div>

The KMD 250 must be receiving altitude information from an altitude source for the Relative Terrain Map to function. Altitude sources may be GPS altitude, pressure altitude (ARINC 429 or Gillham) or baro-corrected altitude. The altitude source options are determined at installation. If no altitude information is received a caution will be displayed as in Figure 1-21.

NOTE: If a baro-corrected or pressure altitude source is used, the Relative Terrain Map may not display colors accurately in operations above 18,000 feet when the altimeter setting is 29.92 in. Hg.
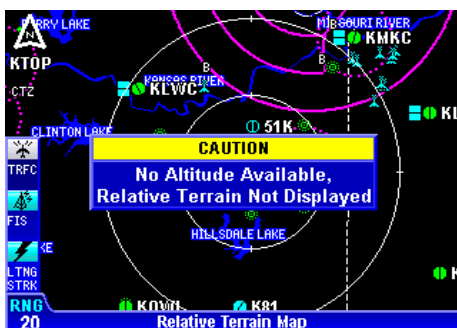
Figure 1-21

Baro Correction

If the altitude information source is Gillham pressure altitude, then a baro correction must be entered manually. If the baro correction is not kept current the Relative Terrain Map will not display the proper color coding for the aircraft's actual altitude.

When on the Relative Terrain

Figure 1-22

Map the KMD 250 will prompt for an entry every 30 minutes as shown in Figure 1-22. Turn the Rotary Knob to enter the desired barometric setting. After the desired setting is entered, press the **OK** Softkey.

NOTE: The manual baro correction entry must be kept current on both the KMD 250 and the altimeter for the Relative Terrain Map to function properly.

The baro correction may also be entered through the **AUX MENU** as follows:

1. Press the **MENU** Key to display the Menu Softkeys as in Figure 1-23.

2. Press the **AUX MENU** Softkey to display Figure 1-24. Use the Joystick to select **Baro Entry** as shown.

3. Press the **SELECT** Softkey and Figure 1-25 will be displayed.

4. Turn the Rotary Knob to select the desired entry.

5. Press the **OK** Softkey.

OBSTACLE LABELS

Obstacles are labeled with two numbers. The first number is the height of the obstacle in FEET ABOVE MSL. The second number (in brackets) is the height of the obstacle in FEET AGL.
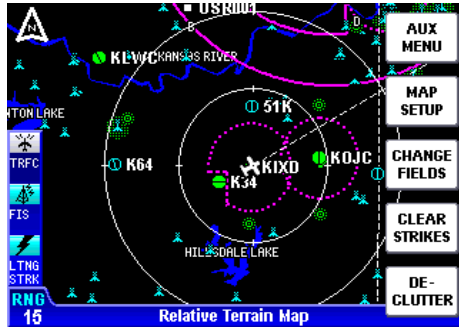
Figure 1-23

Figure 1-24

Figure 1-25

USING THE MAP

After power-up, the map will initially be displayed at a range setting of 20nm.

If there is no valid GPS or FMS position fix data available, the words **CAUTION**, **No position data** will be shown across the center of the display in a box as seen in Figure 1-

Figure 1-26

26. If the fix is lost at any time during normal operation of the unit, the same **CAUTION**, **No position data** box will be overlayed on the map.
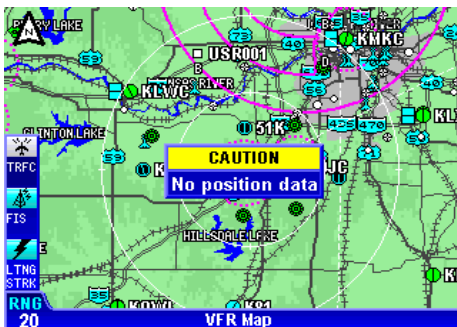
CAUTION: Do not use the map for navigation while this notification is displayed.

The map will be shown in either North Up, Track Up or Heading Up orientation depending upon the setting selected in the Map Setup and is reflected by the North Pointer in the upper left of the display.

The displayed data is updated every second. Press the **RNG Δ** (range up) or **RNG ∇** (range down) key at any time to zoom the map in and out to whichever one of the twelve pre-set scales desired. The available range settings are 1, 2.5, 5, 10, 15, 20, 30, 50, 100, 150, 200, 300, 500 and 1000 nm. The levels of detail appearing at each zoom level can be changed in the Map Setup menu. See Map Setup.

When active, Auto Zoom automatically adjusts the range setting up or down as needed to keep the flight plan active waypoint within the view-able area of the Map display.

Auto Zoom is enabled in either of the following ways:

1. Pressing **RNG ∇** past the minimum setting of 1 nm.

2. Pressing and holding either **RNG** Key for 2 seconds or more. While Auto Zoom is enabled, **AUTO** is displayed in light blue text above the current range setting (see Figure 1-27).

Auto Zoom will be canceled if the flight plan becomes invalid or either **RNG** Key is pressed.
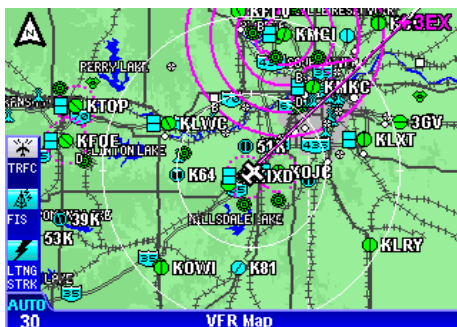
Figure 1-27

MAP DATA INTERROGATION

As soon as the joystick is moved, a display similar to Figure 1-28 will be displayed. The map freezes in its present position with respect to the joystick pointer (inset). The reason the map is made to stop moving is that this makes accurate positioning of the joystick pointer much easier. The aircraft icon will still be displayed in the proper location and will move in relation to the stationary map.

Figure 1-28

The latitude and longitude of the pointer position is displayed at the bottom of the display. The bearing (**PBRG**) and distance (**PDIS**) are also displayed. These show the distance and bearing from the aircraft present position to the joystick pointer. This function can be used to measure distance and bearing to any point on the map. The window formed by the extremities of the display can be moved (panned) around the map by "bumping" the display borders left, right, up or down with the pointer. The **RNG Δ** and **RNG ∇** keys can still be used to zoom the map in and out. Press **RESET STICK** and the

Figure 1-29

Figure 1-30

joystick pointer will vanish, the display will return to the moving map, and the map will be placed back in its present position at the zoom level that was selected prior to activating the joystick. If the joystick is not moved for 30 seconds, the display will time-out back to the moving map.

In addition to finding it useful for measuring distances and bearings, the joystick can be used for other tasks. By placing the pointer over any data icon a window will pop up similar to that shown in Figure 1-29. Pressing the **MORE INFO** Softkey, a display similar to Figure 1-30 will appear.
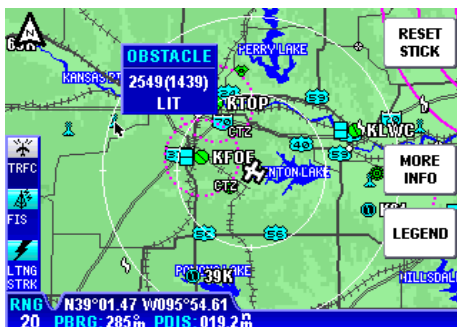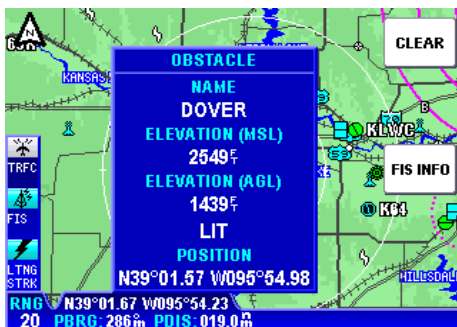
Press the **CLEAR** Softkey to return to the map display.

If the **FIS INFO** Softkey is pressed, the textual METAR page will be displayed for the closest reporting station to the current selection.

AIRPORT INFORMATION

As shown in Figure 1-31, you can display airport information by placing the joystick pointer over an airport icon. Pressing the **MORE INFO** Softkey will display more detailed runway information as shown in Figure 1-32. The **RNG** Keys can be used to zoom in or out on the airport diagram. The information given here is derived from the database. The airport type is shown to the right of the airport identifier (**KOSH**). The airport type is either **MILITARY**, **PRIVATE** or blank for others (public). The airport elevation (**808ft**) is shown to the right of the airport type. Runway orientation and lengths are displayed to the right of the airport diagram. Runway surfaces are shown as an **H** for hard and an **S** for soft. Lighting is shown as an **L** for lit and a **U** for unlit.

Figure 1-31

Figure 1-32

Pressing the **NEXT** Softkey will display more details like radio frequencies and services, similar to Figure 1-33. In the window with the airport identifier, airport airspace information and approach types will be shown. The next window to the right shows the difference between UTC and local standard and daylight times. The next window will display the available fuel types at this airport. See Figure 1-35 for details regarding these fields.
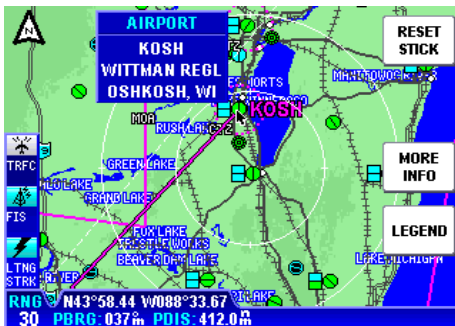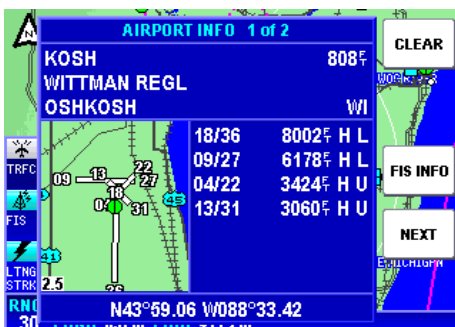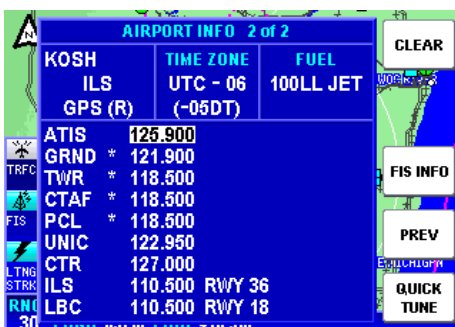
Figure 1-33

Map Operation

If the **FIS INFO** Softkey is pressed, the textual METAR page will be displayed with the current METAR report (if available) for this airport or the nearest report to the airport.

Pressing the **QUICK TUNE** Softkey will tune the appropriate KX 155A/165A Nav/Comm to the selected frequency. Use the Joystick or Rotary Knob to place the cursor over the desired frequency in the list. If the system contains only one KX 155A/165A, simply pressing the **QUICK TUNE** Softkey will tune the Nav/Comm to the selected frequency. If multiple
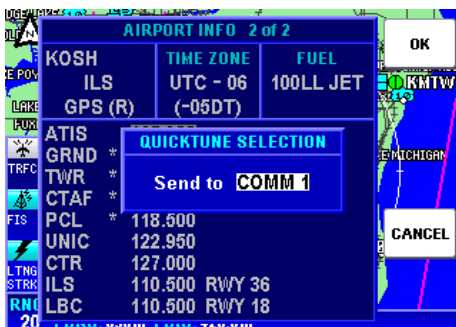
Figure 1-34

KX 155A/165A systems are contained in the installation, pressing the **QUICK TUNE** Softkey will display the Nav or Comm selection display as shown in Figure 1-34. Use the Joystick or Rotary Knob to select the desired Nav or Comm for tuning. Press the **OK** Softkey to tune the radio.
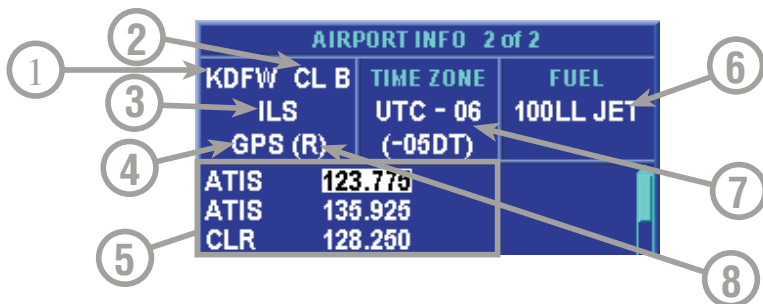
1 AIRPORT ICAO Identifier
2 **Airspace Enviroment** - The following may be displayed in this field:
  CL B Class B airspace
  CL C Class C airspace
  CTA Control Area
  TMA Terminal Area
  TRSA Terminal Radar Service Area
3 **Non GPS Approach Availability** - The following may be displayed in this field:
  NO APR No approaches are available
  NP APR Non-precision approach available
  MLS MLS approach available
  ILS ILS approach available
  ILS/MLS ILS and MLS approaches available
4 **GPS Approach Availability** - If an approved non-precision GPS approach is available GPS will be displayed.
5 **Comm Frequency List** - Lists the available communications frequencies for the airport being displayed. See Appendix A for abbreviations.
6 **Fuel Availability** - The following fuel types may be displayed:
  80 80 to 87 octane
  100 100 to 130 octane
  100LL 100 octane, low lead
  JET Jet fuel, any type
  AUTO Automotive fuel (also known as MOGAS)
7 **Time Zone** - Displays the difference between local standard time and UTC for the selected airport. The difference in local daylight time and UTC is in parenthesis.
8 **Radar Indicator** - If **(R)** is displayed, this indicates an approach/departure radar environment.

Figure 1-35 Airport Info Field Definitions

NAVAID INFORMATION

As explained previously, you can access additional Navaid information by placing the joystick pointer over a VOR or NDB icon to display information similar to Figure 1-35. Pressing the **MORE INFO** Softkey will display more information as in Figure 1-36. Full details of the Navaid are listed,

Figure 1-36

Section 1
Basic Operation

Map Operation

type, frequency and ident as shown in Figure 1-37.

As discussed previously in Airport Information, pressing the **QUICK TUNE** Softkey will tune the appropriate KX 155A/165A Nav/Comm to the navaid frequency. If the system contains only one KX 155A/165A, simply pressing the **QUICK TUNE** Softkey will tune the Nav radio. If multiple KX 155A/165A systems are contained in the installation, pressing the **QUICK TUNE** Softkey will display the Nav selection display as shown in Figure 1-38. Use the Joystick or Rotary Knob to select the desired Nav or Comm for tuning. Press the **OK** Softkey to tune the radio.

Figure 1-37

Figure 1-38

AIRSPACE INTERROGATION

In order to interrogate a piece of airspace on the Map display, move the joystick pointer to one of the airspace boundaries to display an information window as shown in Figure 1-39.

IMPORTANT:

When a single airspace boundary line is shared by two different pieces of air-

Figure 1-39

space (which is very common), the airspace with the lower vertical limit will always be highlighted.

Once it is determined the piece of airspace highlighted is the piece for which information is wanted (you may have to zoom out to verify this, but beware, some airspace switches off as you zoom out dependent on the settings made in Map Setup), press the **MORE INFO** Softkey and additional information will be displayed as in Figure 1-40.
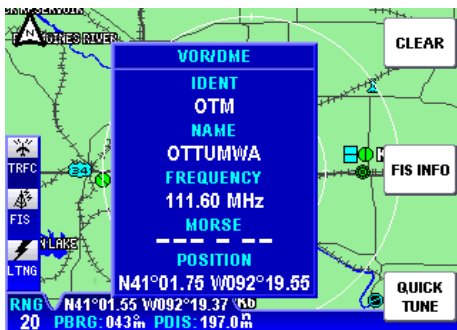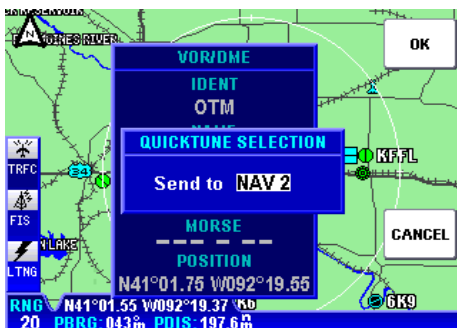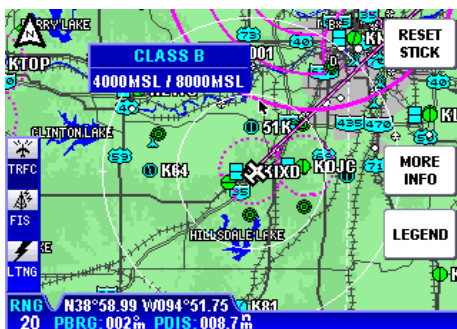
The information shown on this display is all the information from the internal database that is relevant to the airspace selected. If some of the fields are blank or say **SEE CHART**, this means that Jeppesen data is not available for that particular item.

As discussed previously, pressing the **QUICK TUNE** Softkey will tune the appropriate KX 155A/165A Nav/Comm to the selected frequency. Use the Joystick or Rotary Knob to place the cursor over the desired frequency in the list. If the system contains only one KX 155A/165A, simply pressing the **QUICK TUNE** Softkey will tune the Comm to the selected frequency. If multiple KX 155A/165A systems are contained in the installation, pressing the **QUICK TUNE**
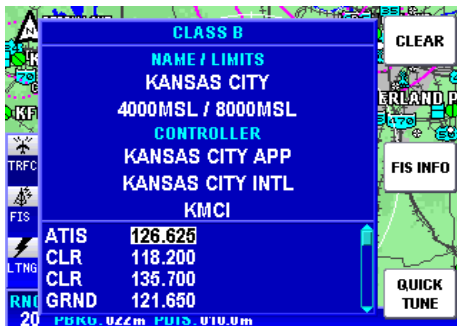
Figure 1-40

Figure 1-41

Softkey will display the Comm selection display as shown in Figure 1-35. Use the Joystick or Rotary Knob to select the desired Comm for tuning. Press the **OK** Softkey to tune the radio.

AIRSPACE ALERTING

The Special Use Airspace (SUA) alert feature is three dimensional. The SUA areas are stored in the KMD 250 database with regard to altitude when the actual SUA altitude limitations are charted in terms of mean sea level (MSL). However, if the actual lower limit of an SUA is charted in terms of an altitude above ground level (AGL), then it is stored in the database as all altitude below the upper limit of the SUA. If the actual upper limit of an SUA is charted in terms of AGL, it is stored in the database as "unlimited".

If the altitude input to the KMD 250 is pressure altitude from an altitude encoder or air data computer, then you must manually update the KMD 250 with an altimeter setting (Baro Correction) in order to receive accurate SUA alerting. See the discussion on Baro Correction earlier in this section. It is a good idea to update the Baro Correction each time you make a change to the aircraft's altimeter setting.

NOTE: If there is no altitude input to the KMD 250, all altitudes will be regarded as being within the boundary of the SUA area.

The message prompt for a special use airspace alert will occur when the aircraft's position is at a point such that a projection of the aircraft's existing track over the ground is approximately 10 minutes from penetrating the outer boundary of one of these areas. It will also occur if the aircraft is within approximately two nautical miles of one of these areas even if the aircraft's projected track over the ground won't actually penetrate the SUA area (see Figure 1-42). If one of the SUA areas is penetrated, another message will state: **Inside SUA**.

The SUA alert feature may be disabled (or enabled) on the Navigation Setup Page. See Navigation Setup later in this section.

Figure 1-42

If the SUA alert feature has been enabled, the KMD 250 allows selection of a vertical buffer on the in order to provide an additional layer of protection from inadvertently entering an SUA. The vertical buffer serves to "stretch" the SUA area in both directions (up and down) by the selected buffer altitude. For example, a buffer of 1,000 feet is selected and the actual SUA area exists from 5,000 feet MSL to 12,000 feet MSL. In this case SUA alert messages are displayed if the aircraft enters the lateral boundary at any altitude between 4,000 and 13,000 feet MSL.

CAUTION

It is the pilot's responsibility to avoid special use airspace where ATC clearance to penetrate is required but has not been obtained. The airspace alert is only a tool to assist the pilot and should never be relied upon as the sole means of avoiding these areas.

When SUA Alerting is enabled, an Airspace Alert message will be provided when the aircraft is approximately 10 minutes or 2 miles (depending on ground speed) from entering the air-space boundary. When an Airspace Alert message is given, **MESSAGE PRESS MENU** will flash at the bottom of the display as shown in Figure 1-43.

Figure 1-43

Pressing the **MENU** Key will display the message as shown in Figure 1-44. Press the **OK** Softkey to exit the message.

To enable or disable SUA Alerting perform the following:

1. Press the **MENU** Key. Press the **AUX MENU** Softkey to display Figure 1-45.

2. Use the Rotary Knob or the Joystick to place the cursor over **Navigation Setup** as shown in Figure 1-45.

Figure 1-44

Figure 1-45

3. Press the **SELECT** Softkey to display Figure 1-46.

4. Press the **NEXT** Softkey to display Figure 1-47.

5. Use the Joystick to place the cursor in the selection field for **SUA Alerting**.

6. Use the Rotary Knob to select **On** or **Off**.

7. When **On** is selected the **SUA Alerting Buffer** will be editable. Use the Joystick to place the cursor over this field (see Figure 1-48) and use the Rotary Knob to select the desired altitude. An Airspace Alert message will be given when the aircraft enters within this selected buffer altitude from the published SUA altitude boundary. For example: if the published upper SUA boundary is 3,000 feet and a buffer altitude of 1,000 feet is selected, the Airspace Alert will be issued when the aircraft descends to 4,000 feet and is within the lateral SUA boundaries.
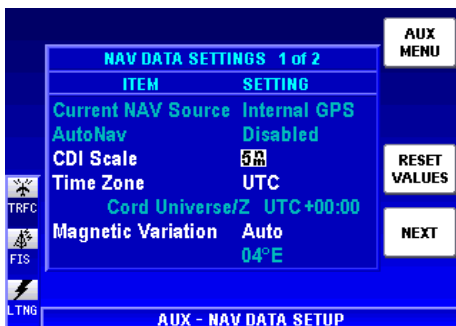
Figure 1-46

Figure 1-47

Figure 1-48

DISPLAY FLIGHT PLAN DATA ON MAP

If a host GPS is outputting data in the Bendix/King equivalent ARNAV R-30 (RS232) data sentence format, in LEG mode, the active flight plan will be sent to the KMD 250 and is displayed as an overlay on the map as shown in Figure 1-49.

Figure 1-49

If a KLN 94 is supplying the GPS data, and the KLN 94 is configured to produce the "Enhanced RS-232 GPS bus", the KMD 250 will display the curved paths including DME arcs, Procedure Turns and Holding Patterns. Figure 1-50 shows an example.

If another type of GPS is used, then during the curved flight segments of approaches (i.e. DME arcs, procedural turns and holds) most GPS units stop outputting flight plan data but continue to output positional data. During a DME arc or procedural turn, the KMD 250 will continue to show position, track and ground speed but the curved line depicting the arc or turn will not be displayed. In OBS mode, some GPS units will not be able to provide flight plan data. Present position is still provided and flight plans will be displayed as soon as the mode is returned to LEG.

Figure 1-50

CAUTION

In the case of DME arcs, turns and holds, some GPS units send the flight plan information as if there was no arc or curved flight path. Therefore the KMD 250 has no option but to connect the beginning and end waypoints of the arc or curve with a straight line. Under these circumstances the line on the KMD 250 MUST BE IGNORED.

TEMPORARILY DECLUTTERING THE MAP

Sometimes it is necessary to temporarily reduce the amount of data displayed on the map in order to make it more readable. This is known as decluttering. Perform the following steps until the desired level decluttering is achieved.

1. Press the **MENU** Key to display the DECLUTTER Softkey as shown in Figure 1-51.

2. Press the **DECLUTTER** Softkey. On the first press the land data will be removed from the display as seen in Figure 1-52. Notice roads, railways, city icons, etc. are no longer displayed. Note also that a **-L** is now shown in the bottom left of the screen indicating the display is minus land data.

3. Press the **DECLUTTER** Softkey again. On the second press the aeronautical data will be removed from the display as seen in Figure 1-53. Notice airports, airspace boundaries, etc. are no longer displayed. Note also that a **-A** is now added in the bottom left of the screen indicating the display is also minus aeronautical data in addition to land data.
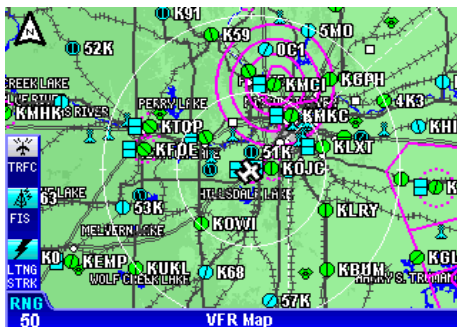
Figure 1-51
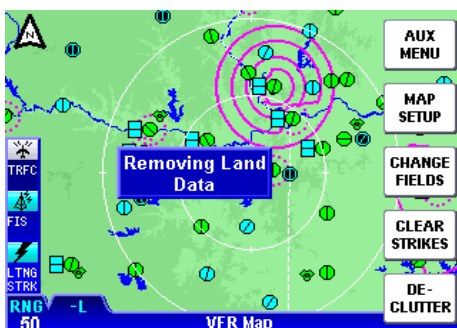
Figure 1-52
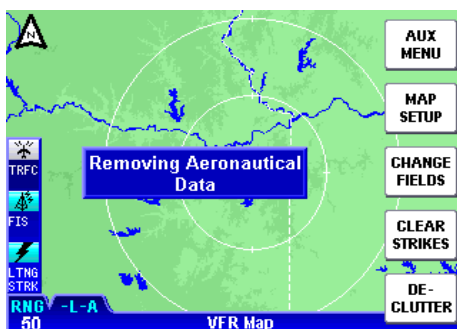
Figure 1-53

4. Press the **DECLUTTER** Softkey again. The third press will now restore the land data as seen in Figure 1-54. Note that the **-L** is no longer shown in the bottom left of the screen indicating land data is now being displayed.

5. Press the **DECLUTTER** Softkey again. The fourth press will now restore the aeronautical data.

Figure 1-54

When leaving the Map display to view another function, all data will be restored.

FIND NEAREST (UNITS WITHOUT INTERNAL GPS)

Find Nearest allows the user to find the airport, VOR, NDB, intersection or user entered waypoint closest to the aircraft's present position. Up to 20 of the find criteria may be listed and must be within 200nm of the aircraft's position. The closest will be listed first, the furthest listed last.

1. Press the **NRST** Key to display the **FIND NEAREST** display as shown in Figure 1-55. In this case a list of airports is displayed.
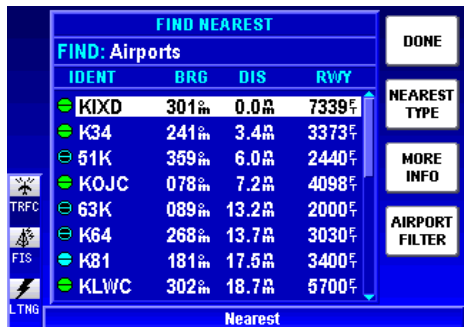
2. If more information on a particular airport is desired, use the Joystick or Rotary Knob to place the cursor over the desired airport identifier and press the **MORE INFO** Softkey. Information on the selected airport will be displayed as in Figure 1-56. Press the **NEXT** Softkey to display more information. Press the **CLEAR** Softkey to return to the **FIND NEAREST** display.
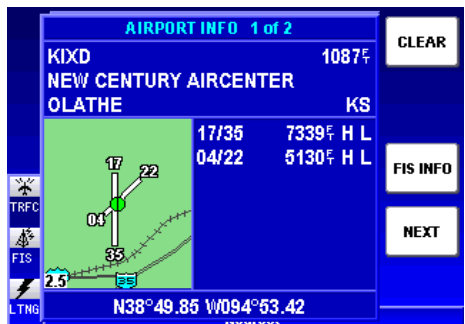
Figure 1-55

Figure 1-56

3. To change to one of the other Find parameters, press the **NEAREST TYPE** Softkey to display the **SELECT NEAREST TYPE** window as shown in Figure 1-57.
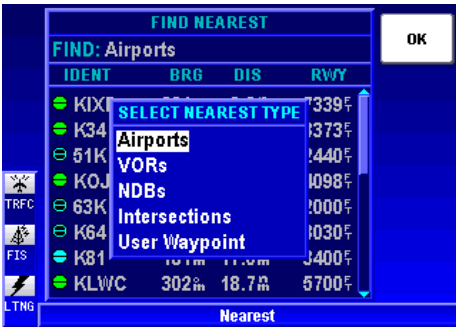
4. Use the Joystick or Rotary Knob to place the cursor over the desired Find type.

5. Press the **OK** Softkey.

6. If Airports is selected as the type (as in Figure 1-57), pressing the **AIRPORT FILTER** Softkey (Figure 1-58) will display the **AIRPORT FILTER CRITERIA** Window as shown in Figure 1-59.
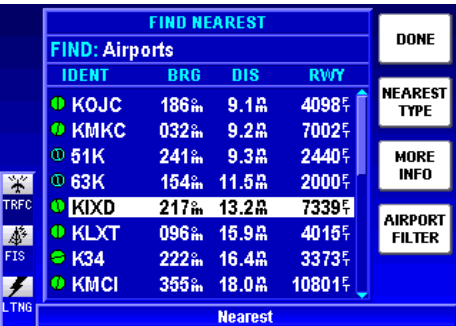
7. The listed airports can be filtered by runway length and runway type. Use the Joystick to place the cursor over the desired field and use the Rotary Knob select the the desired value. When finished press the **OK** Softkey.

Figure 1-57

Figure 1-58

Figure 1-59

FIND NEAREST (UNITS WITH INTERNAL GPS) 🌐

As discussed previously, Find Nearest allows the user to find the airport, VOR, NDB, intersection or user entered waypoint closest to the aircraft's present position. Up to 20 of the find criteria may be listed and must be within 200nm of the aircraft's position. The closest will be listed first, the furthest listed last.

Figure 1-60

1. Press the Direct-To (⬚➡) Key to display the **DIRECT TO** window. If the KMD 250 is not presently navigating using the internal GPS, but is displaying information coming from an external GPS source, Figure 1-60 will be displayed. This is a prompt to indicate the Direct-To function is not available when using an external GPS source.
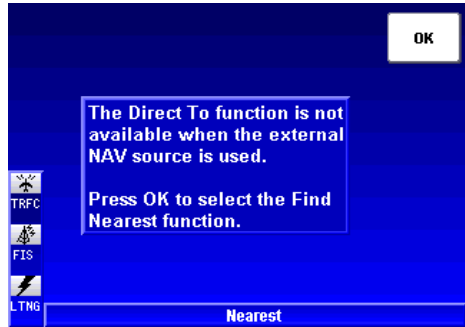
Figure 1-61

However, this will not affect the Find Nearest feature. Press the **OK** Softkey to display the **FIND NEAREST** display. The Find Nearest feature is now used as discussed previously.

If the KMD 250 is presently navigating using the internal GPS, Figure 1-60 will not be displayed and Figure 1-61 will be shown immediately upon pressing the Direct-To Key.

Figure 1-62

2. Press the **NEAREST** Softkey to go to the **FIND NEAREST** display as shown in Figure 1-62. The balance of the Find Nearest feature functions as discussed previously.

WAYPOINT ALERT 🌐

The Waypoint Alert will flash the next desired track (**NEXT DTK**) when the estimated time to the next waypoint is about 15 seconds as shown in Figure 1-63. Turning to establish the **NEXT DTK** will aid in intercepting the next leg of the flight plan.
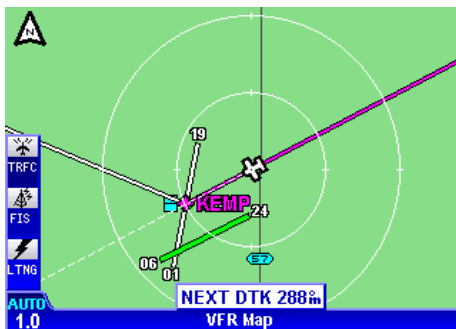
Figure 1-63

If the waypoint is being displayed in a Data Field the **WPT** field will flash annunciating the Waypoint Alert.

When viewing the Flight Plan Page the arrow indicating the current leg will flash to annunciate the Waypoint Alert.

If an external Waypoint Alert annunciator is installed in the aircraft, it will also flash.

TURN ANTICIPATION 🌐

When Turn Anticipation is enabled in Navigation Setup, it will provide turn guidance to a new course for intercepting the next leg of the flight plan.

Waypoint Alerting will begin when the estimated time to the start of the turn is about 20 seconds. As previously discussed, the Waypoint Alert will be annunciated by flashing the next desired track (**NEXT DTK**) window as in Figure 1-64. When the computed turn point is reached **TURN TO** will displayed as shown in Figure 1-65. The required bank angle to follow the arc will normally be between 3° and 25° depending on aircraft speed and the amount of course change.
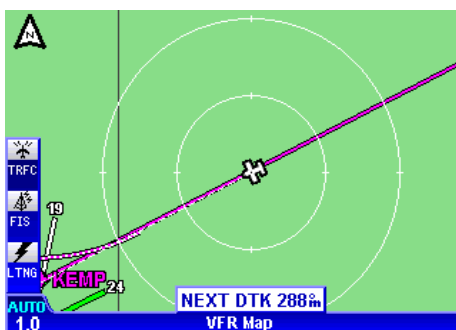
Figure 1-64
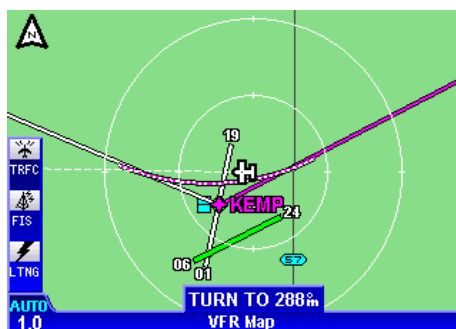
Figure 1-65

Turn Anticipation will be inhibited if the angle between the legs is less than 5° or greater than 175° or the Crosstrack Error (XTK) is greater than 4 nm.

To utilize the Turn Anticipation feature, start the turn transition to the next leg in the flight plan at the very beginning of the computed turn point. Upon reaching this computed turn point the Waypoint Alert annunciator will stop flashing and remain on steadily while the text "**TURN TO**" is displayed as shown in Figure 1-65.

If an autopilot is engaged, this is the time to change the selected course on the CDI or HSI to that indicated next to **TURN TO**. In the case of Figure 1-65 that would be 288° magnetic.

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1-40

USER WAYPOINTS

User waypoints can be entered as either user defined waypoints or as airports. The KMD 250 allows for the programming of up to 1,000 user waypoints. User waypoints are stored on the KMD 250 data card and can be transferred to a new data card when installed.

These waypoints can be used for flight plans if the KMD 250 contains the optional internal GPS, but only if the internal GPS is currently being used for navigation. Flight plans running on an external GPS cannot utilize waypoints stored in the KMD 250.

KMD 250 systems that do not have the internal GPS also allow user waypoints to entered, but can only be used for marking points on the map for such things as points of interest, landing locations not contained in the database, etc.

ENTERING A USER WAYPOINT

The following illustration describes the User Waypoint Edit display.
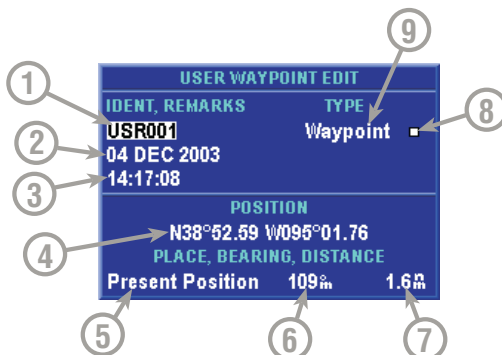
1 Waypoint Identifier - The system default will initially be USR000 and will increment with each entered waypoint up to USR999. Any combination of alphanumeric characters (up to six places) may be entered in place of the default.

2 1st Remarks Field - The default entry is current date. This field may be cleared and any combination of up to 24 alphanumeric and punctuation characters may entered.

3 2nd Remarks Field - The default entry is current time. This field may be cleared and any combination of up to 24 alphanumeric and punctuation characters may entered.

4 Waypoint Latitude/Longitude - Initially, the aircraft position at the time this display was selected is entered here. This field may be changed to place the waypoint at different location.

5 Place - A new waypoint is initially placed at the present position. An airport or navaid identifier can also be entered to define the waypoint position as a bearing and distance from the airport or navaid.

6 Bearing - Can indicate bearing from the current aircraft position to the waypoint, or a bearing may be entered to define a waypoint position relative to an airport or navaid.

7 Distance - Can indicate distance from the current aircraft position to the waypoint, or distance may be entered to define a waypoint position relative to an airport or navaid.

8 Waypoint Icon - Waypoint symbol that will be displayed on the map.

9 Waypoint Type - This field may be changed to indicate **Waypoint** or **Airport** depending on the desired waypoint definition.

The following is a procedure for entering new User Waypoints.

1. Press the **MENU** Key to display Figure 1-66. Press the **AUX MENU** Softkey to display Figure 1-67. Use the Joystick or Rotary Knob to place the cursor over **User Waypoints** as seen in Figure 1-67.

2. Press the **SELECT** Softkey to display the **USER WAYPOINT LIST** display as shown in Figure 1-68. Initially, the list will be empty. As waypoints are entered the list will be populated.
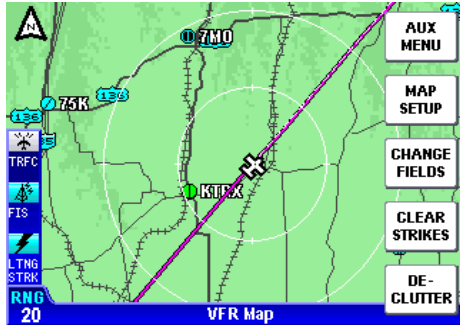
Figure 1-66

Figure 1-67

Figure 1-68

3. Press the **NEW WPT** Softkey to display the **USER WAYPOINT EDIT** display as shown in Figure 1-69.

The system default waypoint identifier will be a naming convention as shown in the **IDENT** field. The default identifier will increment starting with USR000. The user can also enter any identifier desired, but limited to any combination of six alphanumeric characters. If the default identifier is acceptable, proceed to step 5.

Figure 1-69

4. To enter a waypoint identifier other than the system default, turn the Rotary Knob one increment and the first character will be highlighted as in Figure 1-70. If the desired identifier is less than six characters, press the **CLEAR IDENT** Softkey to clear the **IDENT** field. Otherwise, turn the Rotary Knob to enter the desired first character. Use the Joystick to go to the next field and again use the Rotary Knob to enter the next desired character and so on until complete.

Figure 1-70

5. The current date and time default to the two fields under the waypoint identifier. Remarks regarding the waypoint can be entered in these fields in place of the date and time.

Figure 1-71

If remarks are desired, use the Joystick to place the cursor on the first line containing the date as shown in Figure 1-71.
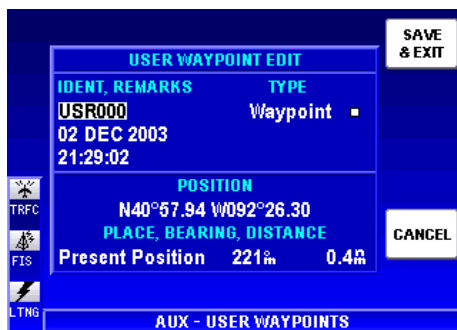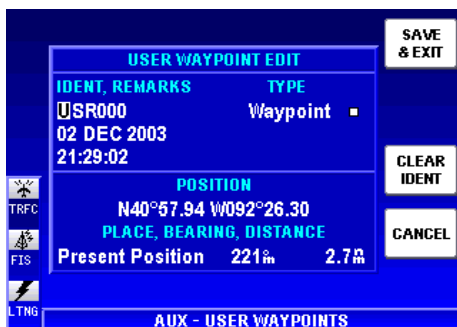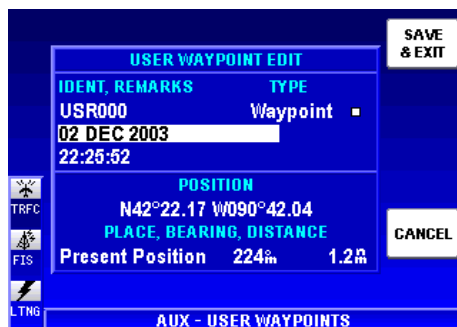
6. Turn the Rotary Knob one increment to highlight the first character on the line as in Figure 1-72.

7. Press the **CLEAR TEXT** Softkey to clear the field as shown in Figure 1-73.

8. Turn the Rotary Knob to enter the desired alphanumeric or punctuation character.

9. Use the Joystick to move the cursor to the next field. Turn the Rotary Knob to enter the desired character. Continue in this manner to enter any combination of alphanumeric and punctuation characters up to 24 characters in length.

10. If a second line of remarks is desired, use the Joystick as discussed previously to place the cursor over the second line. Turn the Rotary Knob one increment. Press the **CLEAR TEXT** Softkey. Repeat steps 7 and 8 until all the desired characters are entered (see Figure 1-74).

11. The default waypoint **POSITION** is the aircraft position at the time the **USER WAYPOINT EDIT** display was selected. The latitude and longitude of the waypoint is displayed. As the aircraft continues moving, the **Present Position** is indicating the current bearing and distance to the waypoint position. Note that these are changing as the aircraft moves.

Figure 1-72

Figure 1-73

Figure 1-74

12. A waypoint can be entered for any position. This can be done in two ways. One way is by entering the desired latitude and longitude of the waypoint. This is done by using the Joystick to place cursor over the latitude/longitude field as shown in Figure 1-74. Turn the Rotary Knob one increment to place the cursor on the first character. Continue turning the Rotary Knob to enter an **N** or **S**. Use the Joystick to move
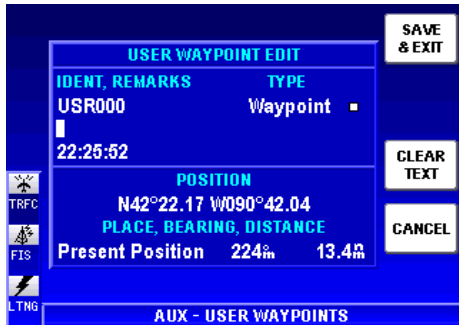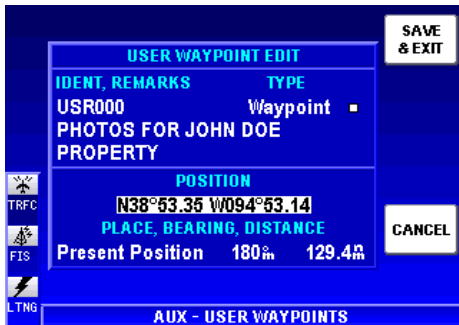
the cursor to the next field. Again, use the Rotary Knob to enter the desired number. Repeat using the Joystick and the Rotary Knob until the desired latitude/longitude is entered.

13. The second way to enter the position of a waypoint is by entering the bearing and distance from a known position, such as an airport or navaid. This is done by first using the Joystick to place the cursor over **Present Position** as shown in Figure 1-75. Turn the Rotary Knob one increment to display the **WAYPOINT ENTRY** window as shown in Figure 1-76.

14. Use a combination of the Joystick and Rotary Knob as previously discussed to enter the desired identifier of the airport or navaid as shown in Figure 1-77. Note the bearing and distance.
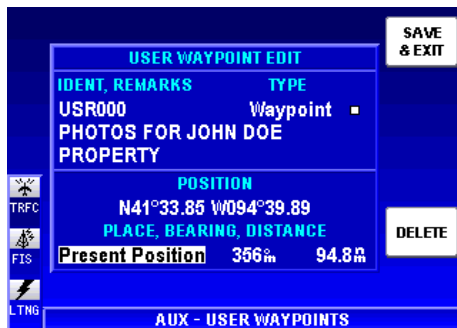
Figure 1-75
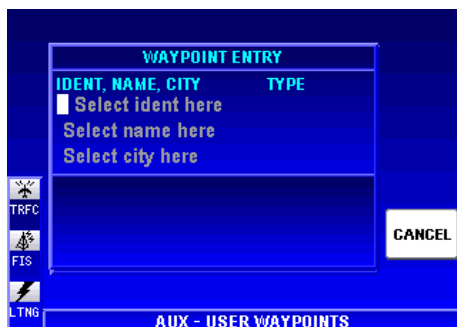
Figure 1-76

Figure 1-77

15. Press the **OK** Softkey and the selected identifier will be entered into the **PLACE** field as shown in Figure 1-78.

16. Use the Joystick to place the cursor over the **BEARING** field as in Figure 1-79.

17. Use the Rotary Knob to enter the waypoint bearing noted from the **WAYPOINT ENTRY** Page.

Figure 1-78

18. In the same way as entering the bearing, use the Joystick to place the cursor over the **DISTANCE** field.

19. Use the Rotary Knob to enter the waypoint distance noted from the **WAYPOINT ENTRY** Page. Note that the KMD 250 has also computed the latitude/longitude for the waypoint.

Figure 1-79

20. Press the **SAVE & EXIT** Softkey.

Also, if a waypoint is defined by entering the latitude/longitude and an airport or navaid identi-fier is then entered, the KMD 250 will compute the bearing and distance of the waypoint from the selected airport or navaid.

After the waypoints are saved, the User Waypoint List is dis-played. Several waypoints

Figure 1-80

have been entered in the example in Figure 1-80. One is a User Entered Airport, denoted by the airport icon (see Entering A User Airport). The lock symbol indicates that the waypoint is part of a flight plan and cannot be deleted until removed from the flight plan.
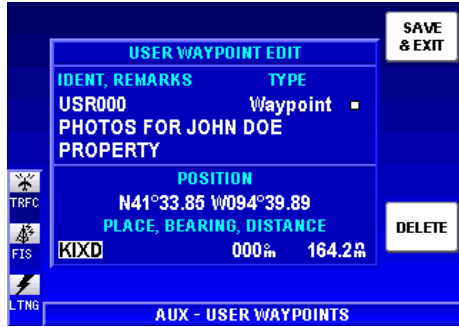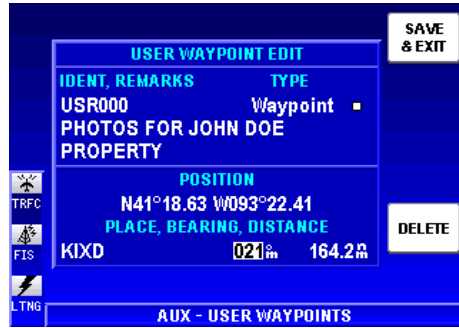
ENTERING A USER AIRPORT

A User Airport is actually a User Waypoint to which additional airport information may be added.

The first User Airport Edit display is used in the same way as the User Waypoint Edit display as previously discussed. The following illustration describes the second User Airport Edit display.

1 **Waypoint Identifier** - Editable on the first User Airport Edit display.
2 **Runway Orientation** - Selectable from **01/19** through **18/36**.
3 **Runway Surface Type** - **Hard** or **Soft** can be selected.
4 **Comm Frequecy Type** - One of 33 abbreviations may be selected in each of two fields. See Appendix A for abbreviations.
5 **Comm Frequecies** - Any valid 8.33 kHz or 25 kHz communication frequency in each of two fields.
6 **Runway Elevation** - The runway elevation can be entered from -2000 to 30,000 ft.
7 **Runway Length** - The length of the runway can be entered from 0 to 20,000 ft.
8 **Airport Icon** - Airport symbol that will be displayed on the map. If the runway **Surface** is set to **Soft**, the symbol will be of the type for a soft runway with no IFR approach. If the runway **Surface** is set to **Hard**, the symbol will be of the type for a hard runway with no IFR approach.
9 **Waypoint Type** - This field reflects **Waypoint** or **Airport** depending on the desired waypoint definition. Selectable on the first User Airport Edit display.

After entering the identifier, remarks and position information as discussed in steps 1 through 19 of Entering A User Waypoint, perform the following to enter additional information airport information.

1. Use the Joystick to place the cursor over the **TYPE** field as shown in Figure 1-81.
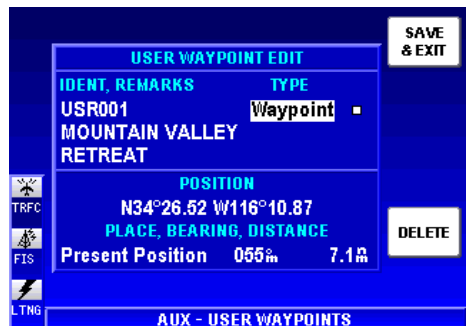
Figure 1-81

2. Turn the Rotary Knob to select **Airport** as shown in Figure 1-82. Note that the display title has changed to **USER AIRPORT EDIT 1 of 2**.
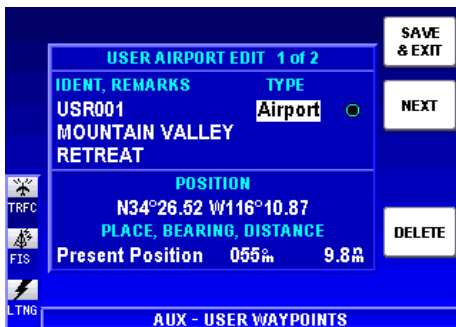
3. Press the **NEXT** Softkey to display **USER AIRPORT 2 of 2** as shown in Figure 1-83. The cursor will be initially be placed in **Runway** orientation field and the default will be **None**.
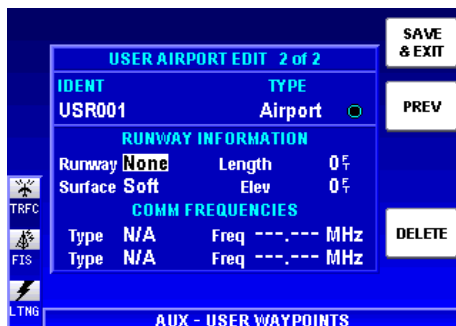
4. Turn the Rotary Knob to enter the desired runway orientation. Values of 01/19 through 18/36 may be entered as seen in Figure 1-84. Note that when a value entered, the airport icon now reflects a runway with the entered orientation.

Figure 1-82

Figure 1-83

Figure 1-84

5. Use the Joystick to place the cursor in the **Surface** field as shown in Figure 1-85.

6. Turn the Rotary Knob to select either Soft or Hard for the type of surface as shown in Figure 1-86. Note that the airport icon has changed to reflect a hard surface runway.

7. Use the Joystick to place the cursor in the runway **Length** field. Use the Rotary Knob to select the desired runway length. A value from 0 to 20,000 feet can be entered. Note that 2000 ft. has been entered in Figure 1-87.

8. Use the Joystick to place the cursor in the runway elevation (**Elev**) field. Use the Rotary Knob to select the desired runway elevation. A value from -2000 to 30,000 feet can be entered. See Figure 1-87.
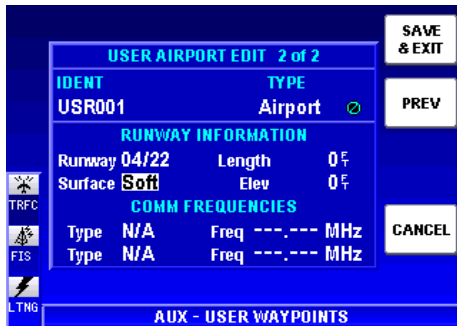
Figure 1-85

Figure 1-86

Figure 1-87

9. Two communication frequencies may be entered to provide QuickTune™ capability. Use the Joystick to place the cursor in the desired comm **Type** field as shown in Figure 1-88.

10. Turn the Rotary Knob to select the desired the frequency type as shown in Figure 1-89. See Table 1-3 for a list of possible **Type** entries.

11. In a similar manner as previously discussed, use the Joystick and the Rotary Knob to enter the desired frequencies in the appropriate **Freq** fields as seen in Figure 1-90.

12. When all desired entries are completed, press the **SAVE & EXIT** Softkey.
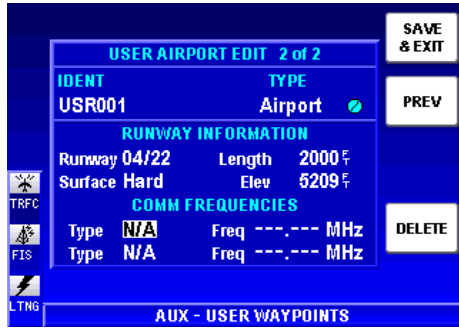
Figure 1-88
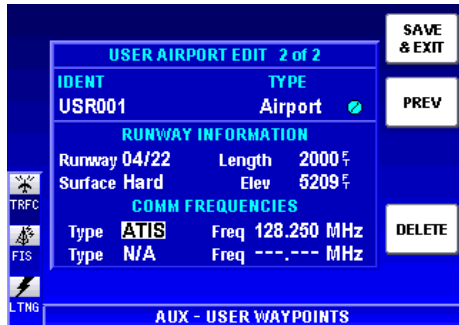
Figure 1-89
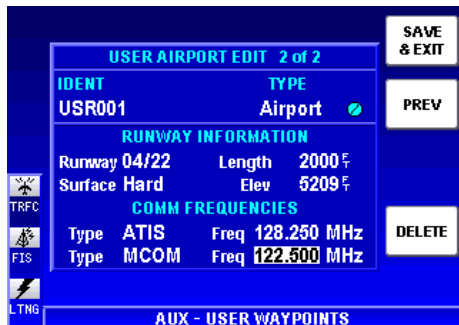
Figure 1-90

ATIS	Automatic Terminal Information Service
PTAX	Pre-Taxi Clearance
CLR	Clearance Delivery
GRND	Ground Control
TWR	Tower
GCO	Ground Communication Outlet
UNIC	Unicom
MCOM	Multicom
CL B	Class B Airspace (VFR Frequency)
CL C	Class C Airspace (VFR Frequency)
TRSA	Terminal Radar Service Area
APR	Approach
DEP	Departure
CTR	Center
ARVL	Arrival
AWOS	Automated Weather Observation System
ASOS	Automated Surface Observation System
CTA	Control Area (VFR frequency used outside U.S.)
DIR	Director (approach control/radar)
TMA	Terminal Area (VFR frequency used outside U.S.)
RDR	Radar-Only Frequency
RDO	Radio
AAS	Aeronautical Advisory Service
AFIS	Aerodrome Flight Information Service
ATF	Aerodrome Traffic Frequency
CTAF	Common Traffic Advisory Frequency
MF	Mandatory Frequency
ILS	Instrument Landing System
LOC	Localizer Approach
LBC	Localizer Back Course
LDA	Localizer Type Directional Aid Approach
SDF	Simplified Directional Facility Approach
IGS	Instrument Guidance System (used outside U.S. only)

Table 1-3 Comm Frequency Types

EDITING A USER WAYPOINT

Editing a waypoint is accomplished in a similar manner to entering a new waypoint. To edit a User Waypoint that has been previously stored, perform the following steps:

1. Press the **MENU** Key to display Figure 1-91. Press the **AUX MENU** Softkey to display Figure 1-92. Use the Joystick or Rotary Knob to place the cursor over **User Waypoints** as seen in Figure 1-92.

2. Press the **SELECT** Softkey to display the **USER WAYPOINT LIST** display as shown in Figure 1-93. Use the Rotary Knob and Joystick to select waypoint to edit.

3. Press the **EDIT WPT** Softkey to display the **USER WAYPOINT EDIT**.

4. Repeat steps 3 through 20 in Entering A User Waypoint.
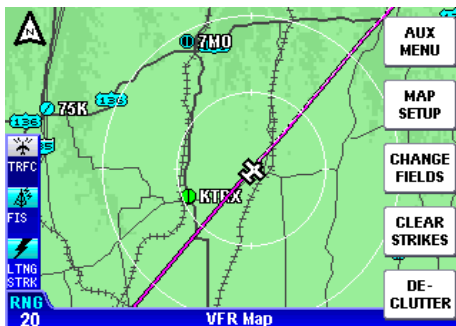
Figure 1-91

Figure 1-92

Figure 1-93

DELETING A USER WAYPOINT

To delete a User Waypoint that has been previously stored, perform the following steps:

1. Perform steps 1 and 2 in Editing A User Waypoint.

2. Press the **DELETE WPT** Softkey. Figure 1-94 will now be displayed.

Figure 1-94

3. Press the **OK** Softkey to complete the deletion.

NOTE: Waypoints that are part of a flight plan (denoted by the lock symbol in the User Waypoint List) cannot be deleted until removed from the flight plan.

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1-54
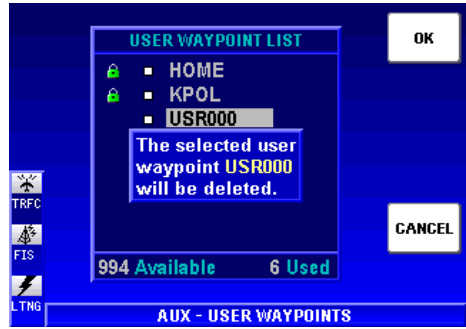
DIRECT-TO OPERATION 🌐

The Direct-To Key initiates operation directly to a destination from the air-craft's present position. This destination can be a User Waypoint or any point defined in the database. It can also be used within an active flight as discussed later in this section.

The KMD 250 must be navigating using the internal GPS when using the Direct-To feature. If an external GPS is selected as the current naviga-tion source, Direct-To will not be accessible on the KMD 250. In this case the Direct-To operation must be performed from the external navigation source.

DIRECT-TO A DATA-BASE OR STORED WAYPOINT

1. If there is no active flight plan, pressing the Direct-To Key will display Figure 1-95.

Figure 1-95

2. Turn the Rotary Knob to display the Waypoint Entry Page as shown previously in Figure 1-76. The desired desti-nation can be entered here by using the Rotary Knob as dis-cussed previously.

3. Press the **OK** Softkey to enter the destination in the **DIRECT TO** field as in Figure 1-96.

Figure 1-96

Also, the **NEAREST** Softkey can be used to select a desti-nation from the **FIND NEAREST** list as discussed earlier in this section. Pressing the **SELECT** Softkey will enter the selected identifier into the **DIRECT TO** field.

4. Press the **ACTIVATE** Softkey and the selected Direct-To route will be dis-played on the Map as shown in Figure 1-97.
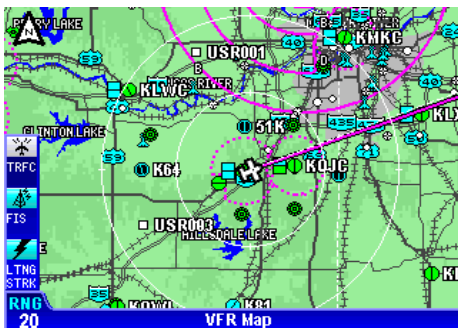
Figure 1-97

DIRECT-TO USING THE JOYSTICK POINTER

1. While on the Map Display, use the Joystick Pointer to select the desired destination as in Figure 1-98. The pointer can be placed anywhere on the map, not just used to select database items.
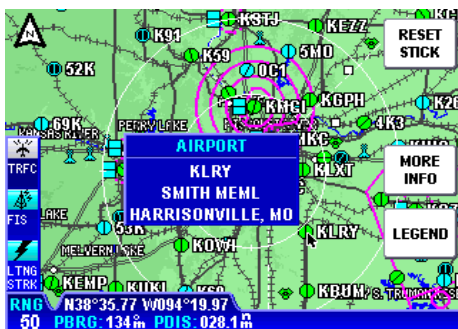
Figure 1-98

2. Press the Direct-To Key and the identifier for the selected destination will be entered into the **DIRECT TO** field as shown in Figure 1-99. If the Joystick Pointer is placed on something other than a database item, the next available default User Waypoint name will appear in the **DIRECT TO** field. This waypoint will be placed on the map at the position of the Joystick Pointer. To change the waypoint name, see the discussion on User Waypoints earlier in this section.

Figure 1-99

3. Press the **ACTIVATE** Softkey and the route will be displayed on the Map as shown in Figure 1-100.
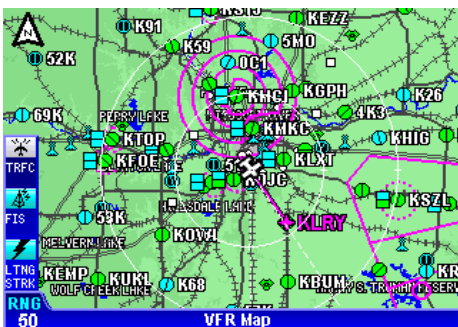
Figure 1-100

OBS COURSE MODE

The Direct-To function also allows an OBS course to be navigated to the selected destination. OBS Course Mode can be used independently to a waypoint, or in conjunction with an active flight plan. See Using OBS Course Mode Within A Flight Plan later in this section.

OBS Course Mode allows the selection of a course based on a bearing "to" or "from" a waypoint much like a VOR receiver.

1. Select the destination as discussed in the Direct-To procedure.

2. Press the **OBS COURSE** Softkey shown in Figure 1-101. This will display the **OBS COURSE** window as shown in Figure 1-102.

NOTE: Unless using OBS Course Mode within an active flight plan, Auto Leg Sequencing (see Appendix A) will be disabled.

3. The course field will be highlighted. Use the Rotary Knob to select the desired OBS course. If desired, the Joystick can be used to select the destination identifier in order to enter a new destination. Turn the Rotary Knob to display the **WAYPOINT ENTRY** window.

4. Press the **ACTIVATE** Softkey and the route will be displayed on the Map as shown in Figure 1-103.

*NOTE: When OBS Mode is active, pressing the Direct-To Key will display the active **OBS COURSE** window.*

To change the OBS course to a Direct-To route press the the

Figure 1-101

Figure 1-102

Figure 1-103

Direct-To Key to display Figure 1-102. Press the **DIR TO** Softkey and a Direct-To will be selected for the current identifier. Press the **ACTIVATE** Softkey to enter and display the Direct-To route.

To center the CDI, from the **OBS COURSE** window (Figure 1-102) press the **DIR TO** Softkey then press the **OBS COURSE** Softkey. The CDI will now be centered.
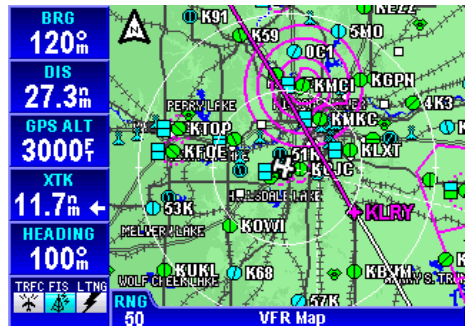
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FLIGHT PLAN OPERATION

VFR flight plans can be created in the KMD 250 when configured to use the internal GPS. In units without the optional internal GPS the active flight plan from the external GPS may be viewed.

The **FPL** Key is used to toggle between the **ACTIVE FLIGHT PLAN** Page and the **FLIGHT PLAN INDEX** Page.
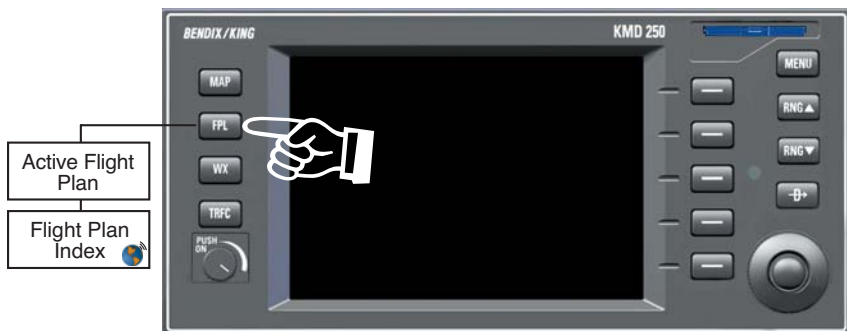
NOTE: The internal GPS of the KMD 250 is not certified for IFR operation.

The KMD 250 calculates a flight plan by picking the most direct route between selected waypoints. This is known as Leg Mode operation.

VIEWING THE ACTIVE FLIGHT PLAN

Press the **FPL** Key to display the **ACTIVE FLIGHT PLAN** Page as shown in Figure 1-104. If the KMD 250 does not have the optional internal GPS the **DONE** and **DELETE WPT** Softkeys will not be available.

The active leg and waypoint are shown in magenta. When Auto Leg Sequencing is enabled, after passage of the active waypoint the KMD 250 will automatically sequence to the next waypoint in the flight

Figure 1-104

plan. The next leg and active waypoint will then be displayed in magenta.
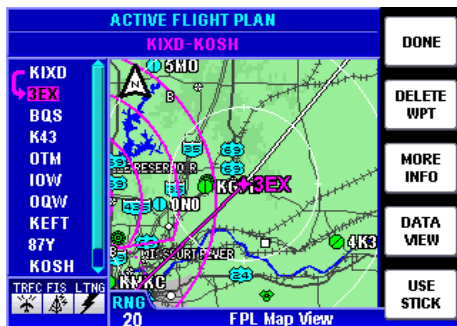
The waypoints in the flight plan are listed on the left of display. Moving the Joystick up or down will scroll through the waypoints. The magenta arrow denotes the current leg of the flight plan. The active waypoint identifier is also displayed in magenta. When scrolling through the way-

points, as each waypoint is highlighted it is displayed on the map centered in the window. The current leg and active waypoint are shown in magenta on the map.

Information about a waypoint can be viewed by using the Joystick to select the desired waypoint identifier in the list and then pressing the **MORE INFO** Softkey. Information will be displayed as shown in Figure 1-105. Press the **CLEAR** Softkey to exit.

Figure 1-105

Pressing the **USE STICK** Softkey will allow use of the Joystick Pointer for map inter-rogation as discussed previously in Map Operation (see Figure 1-106. Press the **RESET STICK** Softkey to exit Joystick Pointer operation.

Figure 1-106

If applicable, press the **MORE INFO** softkey to view more information about the selection. In the case of an airport, pressing the **NEXT** softkey on the **AIRPORT INFO 1 of 2** Page will display the **AIRPORT INFO 2 of 2** and allow access to the **QUICK TUNE** Softkey. Pressing this softkey will tune the radios to the correct frequencies for the airport as discussed previously in Airport Information.

VIEWING FLIGHT PLAN DATA

When viewing the the **ACTIVE FLIGHT PLAN** Page (Figure 1-105) or the **STORED FLIGHT PLAN** Page, pressing the **DATA VIEW** Softkey will display more detailed data pertaining to the flight plan selected as shown in Figure 1-107. Pressing the MAP VIEW Softkey will return to the previous map view display.

Figure 1-107

FUEL FLOW

If the KMD 250 is installed in conjunction with a fuel flow monitor, the actual fuel flow and estimated fuel usage calculations will be displayed in white as in Figure 1-107. This will allow the KMD 250 to calculate the fuel flow for each leg of the flight plan based on current ground speed. If no fuel flow monitor is used, the value may be entered manually by using the Joystick to select the **FFLOW** field. Use the Rotary Knob to enter the desired value. User entered values, and calculations based on user entered data are displayed in yellow as seen in Figure 1-108.

*NOTE: Fuel flow values can only be entered manually on the **ACTIVE FLIGHT PLAN** Page if no fuel flow monitor is installed.*
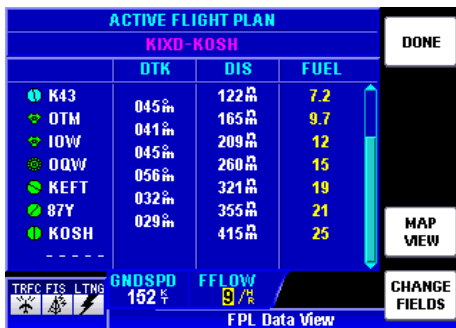
CHANGING THE DATA COLUMNS

The three data columns can be changed to reflect various types of information for each leg. To change the columns perform the following steps.

1. Press the **CHANGE FIELDS** Softkey to display Figure 1-109.

Figure 1-108

Figure 1-109

DIS	Distance En Route
DTK	Desired Track
ESA	En Route Safe Altitude
ETA	Estimated Time of Arrival
ETE	Estimated Time En Route
FUEL	Estimated Fuel En Route
Leg Dis	Leg Distance
Leg Fuel	Estimated Leg Fuel
Leg MSA	Leg Minimum Safe Altitude
Leg Time	Estimated Leg Time
Sunrise	Sunrise Time
Sunset	Sunset Time

2. Move the Joystick horizontally to select the desired data column (in this case the first column).

3. Turn the Rotary Knob to select one of the available options from the list. Each field can be customized to display any of the following:

4. Press the **DONE** Softkey when finished and the columns will now display the selected data options.

Pressing the **RESTORE DEFAULT** Softkey to change the columns back to the factory settings.

CREATING A FLIGHT PLAN 🌐

A maximum of 99 flight plans may be stored in the KMD 250. Each flight plan may contain up to 99 waypoints. To create a new flight plan, perform the following steps.

Figure 1-110

1. Press the **FPL** Key to toggle to the **FLIGHT PLAN INDEX** Page. Initially, if no flight plans have been stored, the display will appear as shown in Figure 1-110.
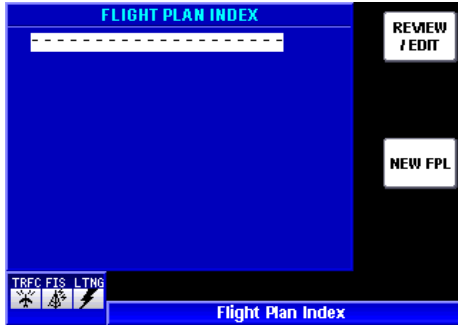
2. Press the **NEW FPL** Softkey to display the **STORED FLIGHT PLAN** Page as seen in Figure 1-111. The first waypoint in the flight plan can be entered using the Joystick Pointer and selecting a point on the map or by entering an identifier.

Figure 1-111

To enter an identifier, turn the Rotary Knob and the **WAYPOINT ENTRY** window will be displayed as in Figure 1-112. Use the Rotary Knob to enter the desired starting waypoint in the same manner as discussed in previous procedures.

Figure 1-112

Press the **OK** Softkey and the first waypoint is entered in the list as shown in Figure 1-113.

To select the waypoint using the Joystick Pointer, press the **USE STICK** Softkey. Using the Joystick, move the pointer to the desired place on the map as in Figure 1-114. Press the **INSERT WPT** Softkey to enter the waypoint in the list.

3. Continue entering waypoints using either method until the flight plan is complete. Press the **DONE** Softkey and the flight plan will be entered on the **FLIGHT PLAN INDEX** Page as shown in Figure 1-115.

Figure 1-113
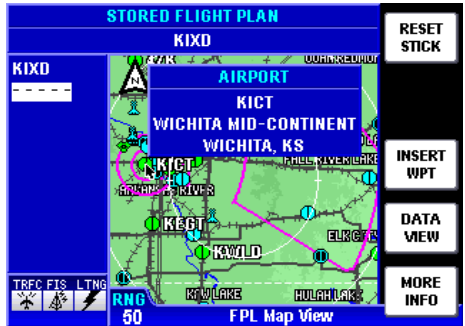
Figure 1-114
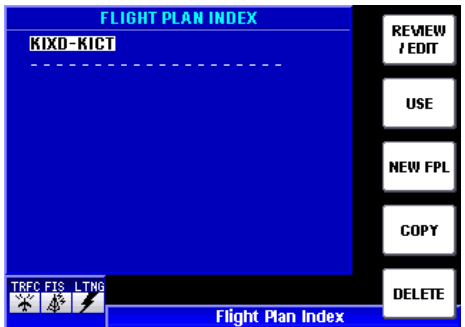
Figure 1-115

4. To start using the flight plan press the **USE** Softkey. Figure 1-116 will be displayed.

5. Press the **OK** Softkey to activate the flight plan as shown in Figure 1-117.

ACTIVATING A STORED FLIGHT PLAN 🌐

Perform the following steps to activate a flight plan that has been stored in the KMD 250.

1. Press the **FPL** Key to display the **FLIGHT PLAN INDEX** Page as seen in Figure 1-118. Note that the current active flight plan is displayed in magenta with an arrow at the top of the list stored flight plans.

2. Use the Joystick to select the desired flight plan in the list.
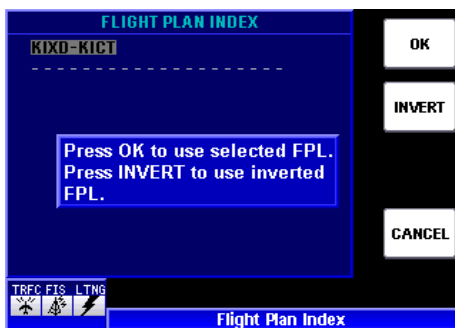
Figure 1-116

Figure 1-117
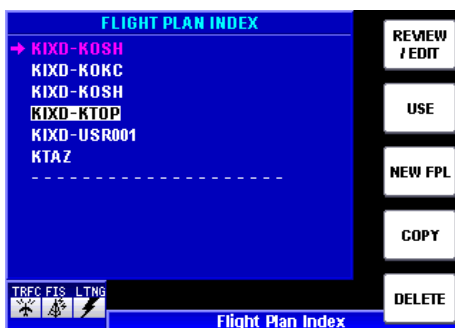
Figure 1-118

3. Press the **USE** Softkey and Figure 1-119 will be displayed.

4. Press the **OK** Softkey to use the selected flight plan. If desired, the selected flight plan can be navigated in reverse by pressing the **INVERT** Softkey. The selected flight plan will now be displayed on the **ACTIVE FLIGHT PLAN** Page as in Figure 1-120.

5. Press the **DONE** Softkey to return to the **FLIGHT PLAN INDEX** Page.
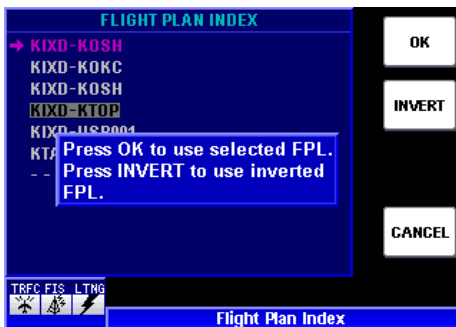
Figure 1-119

Figure 1-120

EDITING A STORED FLIGHT PLAN

To edit the active or a stored flight plan, begin by pressing the **FPL** Key to display the **FLIGHT PLAN INDEX** Page as seen in Figure 1-121. Press the **EDIT/REVIEW** Softkey to display Figure 1-122. Now various editing parameters may be accomplished as in the following discussions.

Pressing the **COPY** Softkey will allow the selected flight plan to be copied for editing while not changing the original.

DELETING A WAYPOINT IN THE FLIGHT PLAN

To delete a waypoint in the flight plan, perform the following steps.

1. Use the Joystick to select the waypoint to be deleted in list on the left of the display.

2. Press the **DELETE WPT** Softkey to display Figure 1-123. Press the **OK** Softkey to delete the waypoint.

3. Press the **DONE** Softkey to return to the **FLIGHT PLAN INDEX** Page.
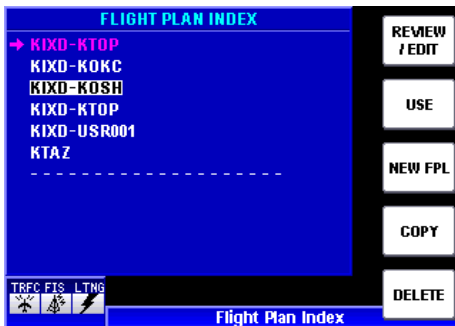
Figure 1-121

Figure 1-122
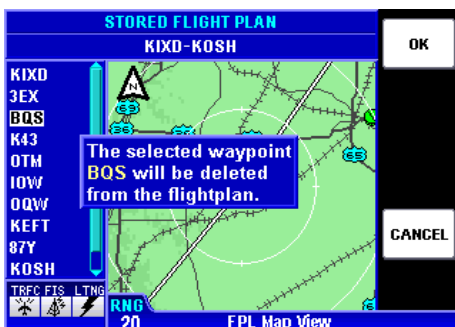
Figure 1-123

INSERTING A WAYPOINT IN THE FLIGHT PLAN

To insert a waypoint in the flight plan, perform the following steps.

1. Use the Joystick to select a waypoint in list to which the new waypoint will be inserted before or after (in this case OTM) as shown in Figure 1-124.

2. Select the new waypoint with one of the following methods.

To enter an identifier, turn the Rotary Knob and the **WAYPOINT ENTRY** window will be displayed as in Figure 1-125. Use the Rotary Knob to enter the desired waypoint (KTVK) in the same manner as discussed in previous procedures. Press the **OK** Softkey and the waypoint is entered before OTM as shown in Figure 1-126.

Figure 1-124

Figure 1-125

Figure 1-126

To select the waypoint using the Joystick Pointer, press the **USE STICK** Softkey. Using the Joystick, move the pointer to the desired place (KTVK) on the map as in Figure 1-127. Press the **INSERT BEFORE** or **INSERT AFTER** Softkey to enter the waypoint before or after the waypoint selected in the list as seen in Figure 1-128.

3. Press the **RESET STICK** Softkey and the new waypoint will be displayed in the flight plan as in Figure 1-129.

4. Press the **DONE** Softkey to return to the **FLIGHT PLAN INDEX** Page.

Figure 1-127

Figure 1-128

Figure 1-129

CHANGING THE NAME OF THE FLIGHT PLAN

The name of the flight plan can be changed from either the **STORED FLIGHT PLAN** or **ACTIVE FLIGHT PLAN** Pages while in **FPL Map View** or **FPL Data View**.

Figure 1-130

To change the name of the flight plan, perform the following steps.

1.   Use the Joystick to select the flight plan name as shown in Figure 1-130.

2.   Turn the Rotary Knob one increment and the flight plan name will shift to the left with the first character highlighted as in Figure 1-131.

Figure 1-131

3.   Use the Rotary Knob to enter the desired first character for the new waypoint name.

4.   Use the Joystick to select the next character field.

5.   Use the Rotary Knob to enter the next desired character for the new waypoint name.   Continue until the desired name is entered as seen in Figure 1-132.

Figure 1-132

Pressing the **DEFAULT NAME** Softkey will cause the flight plan name to revert back to name previously given by KMD 250. Pressing the **CLEAR NAME** Softkey will delete all characters in the flight plan name field allowing different characters to be entered.

6. Press the **OK** Softkey and the new name will shift back to the center as in Figure 1-133.

7. Press the **DONE** Softkey and the new flight plan name will be displayed in the list of flight plans as shown in Figure 1-134.

Figure 1-133

DELETING A STORED FLIGHT PLAN

To delete a flight plan, perform the following steps.

1. Press the **FPL** Key until the **FLIGHT PLAN INDEX** Page is displayed as shown in Figure 1-134.

2. Use the Joystick to select the flight plan name.

Figure 1-134

3. Press the **DELETE** Softkey and Figure 1-135 will be displayed.

4. Press the **OK** Softkey and the flight plan will be deleted.
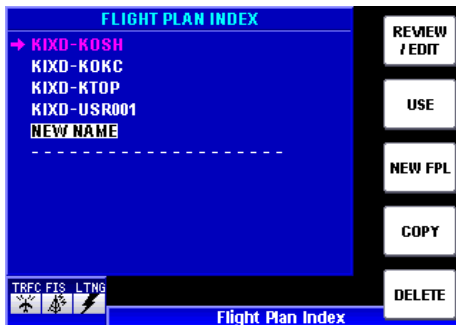
Figure 1-135

DELETING THE ACTIVE FLIGHT PLAN 🌐

To delete the active flight plan perform the following steps:

1. Press the **FPL** Key until the **FLIGHT PLAN INDEX** Page is displayed as shown in Figure 1-136. Note that the active flight plan is highlighted in magenta.

Figure 1-136

2. Press the **DELETE** Softkey and Figure 1-137 will be displayed to verify the deletion of the active flight plan.

3. Press the **OK** Softkey to delete the active flight plan. As shown in Figure 1-138, the active flight plan is no longer displayed. Note also that the previously active flight plan has not been deleted from the list of stored flight plans.

Figure 1-137

NOTE: If the active flight plan has not been stored prior to deleting, press the COPY Softkey to store a copy of the active flight plan before pressing the DELETE Softkey.
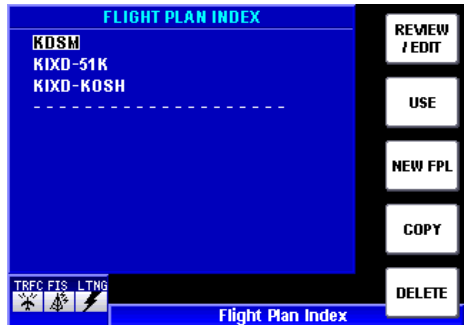
Figure 1-138

USING DIRECT-TO IN THE ACTIVE FLIGHT PLAN 🌐

Sometimes it may be desirable to proceed directly to a waypoint in a flight plan or a specific leg in a flight plan. For example, after takeoff in a terminal area, vectors may be given followed by a clearance directly to the first waypoint in the filed flight plan or to intercept a particular leg in the filed flight plan. A Direct-To can be performed to the waypoint or to the flight plan leg. After reaching the waypoint or leg the KMD 250 will automatically begin navigating the active flight plan. If waypoints exist in the flight plan prior to that which the Direct-To is established, these waypoints will be bypassed. If a Direct-To is established to a waypoint not in the flight plan, the navigation of the active flight plan will not resume after the Direct-To waypoint is reached.

NOTE: Remember, the internal GPS of the KMD 250 is not certified for IFR operation. Navigation of ATC clearances on the KMD 250 can only be done as a backup to the primary navigation system.

PROCEEDING DIRECT-TO AN ACTIVE FLIGHT PLAN WAYPOINT

To do a Direct-To to a waypoint within an active flight plan perform the following steps.

1. Press the Direct-To Key to display Figure 1-139.

2. Use the Joystick to scan the waypoints in the active flight plan.

Figure 1-139

3. When the desired waypoint is displayed, press the **ACTIVATE** Softkey and the Map will again be displayed as in Figure 1-140. Note the Direct-To is now plotted from aircraft's present position to the waypoint.
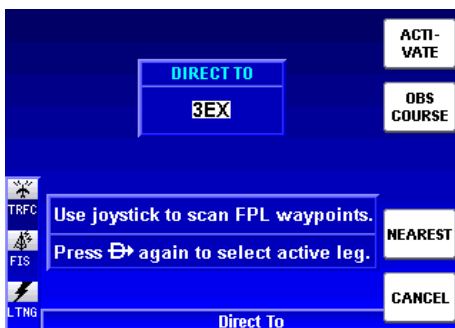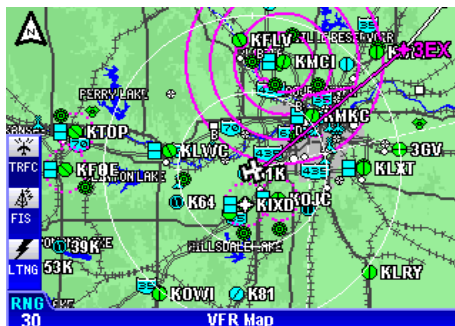
Figure 1-140

4. The Direct-To will also be denoted on the **ACTIVE FLIGHT PLAN** Page. Press the **FPL** Key and note the change in the magenta arrow in the waypoint list indicates a Direct-To the waypoint as shown in Figure 1-141.

After the waypoint is reached, the KMD 250 will navigate the remainder of the active flight plan.

Figure 1-141

MANUALLY SELECTING AN ACTIVE FLIGHT PLAN LEG

To select a specific leg within an active flight plan perform the following steps.

1. Press the Direct-To Key to display the Direct-To window as shown previously in Figure 1-139 .

2. Press the Direct-To Key a second time to display Figure 1-142.

3. Use the Joystick to scan the flight plan legs.

4. When the desired leg is displayed, press the **ACTI-VATE** Softkey and the Map will again be displayed as in Figure 1-143. Note the airplane is navigating to intercept the selected flight plan leg.
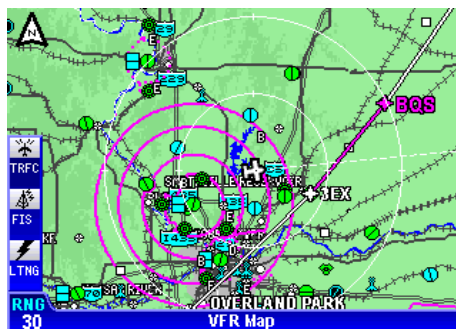
Figure 1-142

Figure 1-143

After the leg is intercepted, the KMD 250 will provide navigation guidance the remainder of the active flight plan.

DELETING A DIRECT-TO WITHIN THE ACTIVE FLIGHT PLAN

If it becomes necessary to delete a Direct-To in an active flight plan (as seen in Figure 1-140), perform the following steps:

1. Press the Direct-To Key to display Figure 1-144.

2. Press the **DELETE DIRECT** Softkey to display Figure 1-145.

3. Press the **OK** Softkey. The Map will again be displayed with guidance to intercept and resume the active flight plan as shown in Figure 1-146.
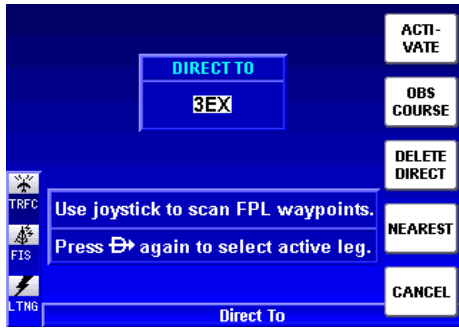
Figure 1-144
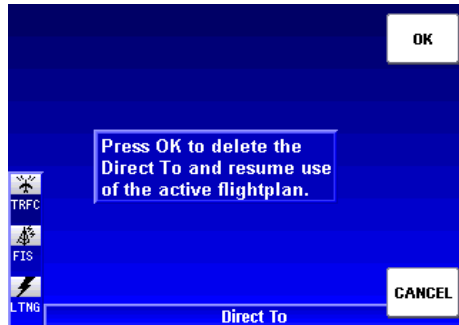
Figure 1-145
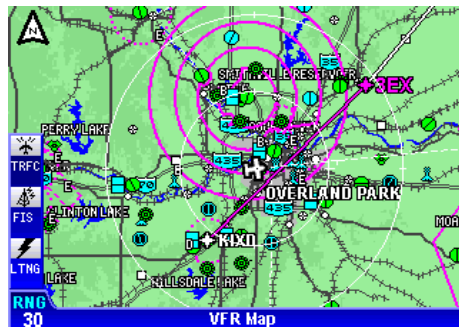
Figure 1-146

USING OBS COURSE MODE IN THE ACTIVE FLIGHT PLAN 🌐

It may also be desirable to proceed directly to a waypoint in a flight plan on a specific bearing. An OBS Course can be set to the waypoint. If Automatic Leg Sequencing (see Appendix A) is enabled, after reaching the waypoint the KMD 250 will automatically begin navigating the next leg in the active flight plan. If Automatic Leg Sequencing is disabled, the aircraft will overfly the waypoint and continue on the selected course. If waypoints exist in the flight plan prior to that which the OBS Course is established, these waypoints will be bypassed. If an OBS Course is established to a waypoint not in the flight plan, the navigation of the active flight plan will not resume after the waypoint is reached.

SETTING AN OBS COURSE TO AN ACTIVE FLIGHT PLAN WAYPOINT

To set an OBS Course to a waypoint within an active flight plan perform the following steps.

1. Press the Direct-To Key to display Figure 1-147.

2. Use the Joystick to scan the waypoints in the active flight plan.

3. When the desired waypoint is displayed, press the **OBS COURSE** Softkey to display Figure 1-148. Enter the desired bearing "to" or "from" the waypoint.

Figure 1-147
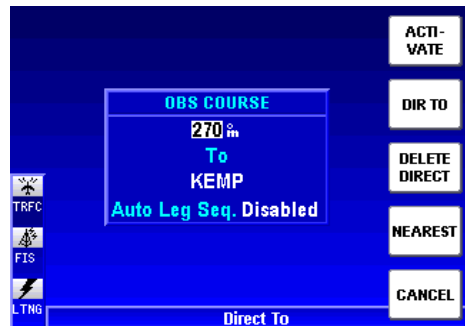
Figure 1-148

4. Use the Joystick to highlight the **Auto Leg Seq.** field as shown in Figure 1-149.

5. Use the Rotary Knob to select **Enabled**. With Auto Leg Sequencing enabled the remaining portion of the flight plan will automatically resume after passing the waypoint.

6. Press the **ACTIVATE** Softkey to start navigating the OBS Course. The selected course will be displayed as the active portion of the flight plan as seen in Figure 1-150.
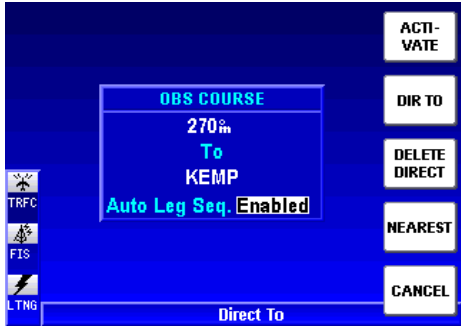
Figure 1-149
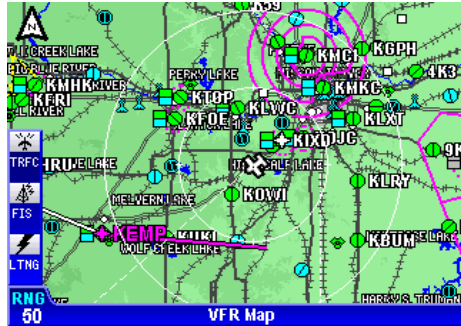
Figure 1-150

DELETING AN OBS COURSE WITHIN THE ACTIVE FLIGHT PLAN

If it becomes necessary to cancel the selected OBS Course in an active flight plan (as seen in Figure 1-150), perform the following steps:

1. Press the Direct-To Key to display Figure 1-151.

2. Press the **DELETE DIRECT** Softkey and Figure 1-152 will be displayed.

3. Press the **OK** Softkey to confirm the deletion. The map will now display the active flight plan in Leg Mode as shown on Figure 1-153.

Figure 1-151
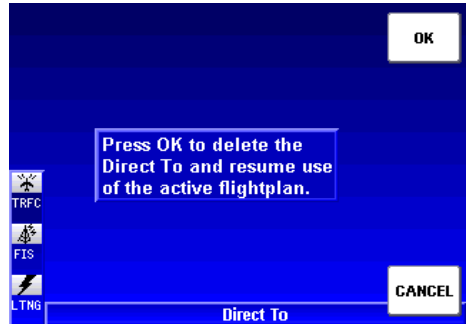
Figure 1-152
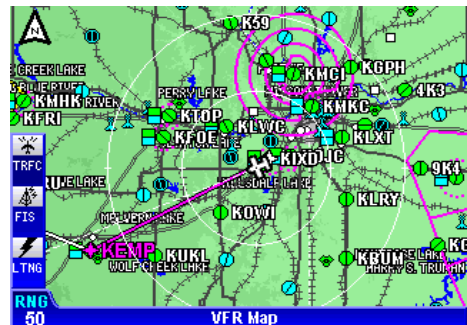
Figure 1-153

TRIP PLANNING USING PRESENT POSITION 🌐

For planning purposes the internal calculator can be used to determine such things as time, distance and required fuel to waypoints, for another flight plan or for modifications to the active flight plan. This is done by inserting the aircraft's present position into a desired scenario and using the data view of the Active Flight Plan Page and selecting the desired data columns to present the needed information.

The following example illustrates checking time, distance and required fuel to KDSM while navigating a flight plan from KIXD to KOSH as shown on Figure 1-154.

1. Perform the following steps to create a new flight plan as previously discussed.

2. Enter the desired destination (in this case KDSM) using the Rotary Knob as shown in Figure 1-155.

3. Press the **OK** Softkey to display Figure 1-156.
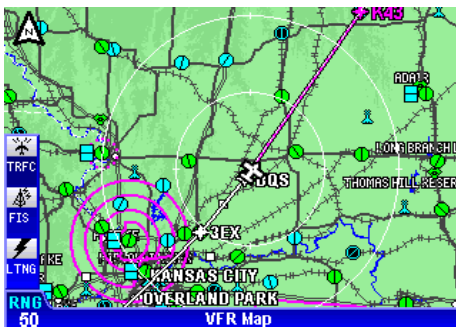
Figure 1-154

Figure 1-155
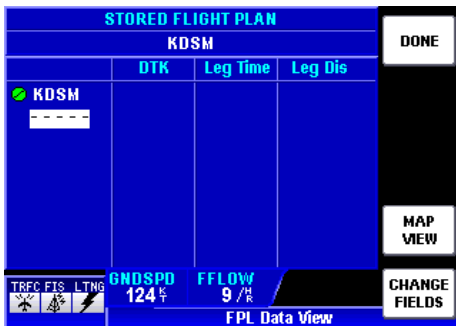
Figure 1-156

4. Use the Joystick to high-light the destination identifier as shown in Figure 1-157.

5. Turn the Rotary Knob one increment to display Figure 1-158.

6. Press the **INSERT PPOS** Softkey and the aircraft's present position will be inserted before the selected identifier as seen in Figure 1-159. ETA, distance and required fuel to KDSM are now displayed in the data columns based on current ground speed and fuel flow (**FFLOW**) value indicated.

Inserting the aircraft's present position in the flight plan is just like inserting any other way-point in the flight plan except the position continually updates.

Note the ground speed and fuel flow values shown in Figure 1-159 indicate actual values by being displayed in white. Fuel flow is taken from a fuel flow monitor and GPS ground speed is being used.

7. If desired, press the **CHANGE FIELDS** Softkey to change the data columns as discussed previously to view other calculated data for the destination.

Figure 1-157

Figure 1-158

Figure 1-159

8. If desired, both the ground speed (**GNDSPD**) and fuel flow (**FFLOW**) can be changed to a user defined number to view various "what if" sce-narios.
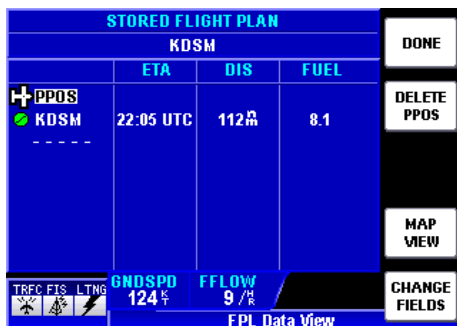
9. To change the ground speed as in Figure 1-60, Use the Joystick to place the cursor in the desired field. Use the Rotary Knob to enter the desired values. Note the changes to the **ETA** and **FUEL**. Yellow indicates user entered data and data calculated from user entered data.

10. With the cursor over the **GNDSPD** value, press the **USE ACTUAL** Softkey to return the ground speed to the actual GPS ground speed as shown in Figure 1-161. Note also that the **ETA** and **FUEL** values have also returned to actual values.

Fuel flow (**FFLOW**) values can be changed in the same manner as ground speed. Fuel flow and ground speed can also be changed in conjunction with one another to work out different scenarios.

Figure 1-160

Figure 1-161

NOTE: If the KMD 250 is not interfaced with a functioning fuel flow monitor, the fuel values will always be displayed in yellow.

11. Press the **DONE** Softkey to return to the **FLIGHT PLAN INDEX** Page. The flight plan created in this process can now be deleted if no longer needed.

SYSTEM SETUP

This portion of the manual is designed to provide step by step instructions for the setup of the KMD 250. Note that not all features discussed here are available in all installations. If an item is not available it will appear "grayed out" and will not be selectable.
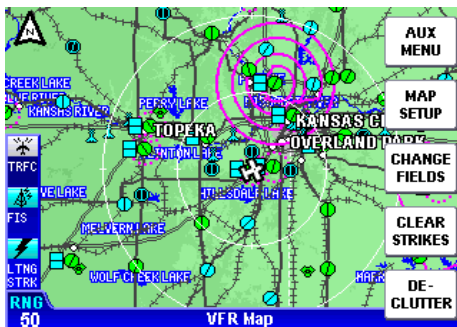
Figure 1-162

MAP SETUP

1. Press the **MENU** Key to display Figure 1-162. Press the **MAP SETUP** Softkey to display Figure 1-163. Use the Joystick to select the desired field and turn the Rotary Knob to make the desired changes.

Pressing the **OVLY SETUP** Softkey will go directly to **OVERLAYS GROUP** Page for selection of map overlays as discussed later in Map Setup.

Figure 1-163

Orientation: Set either in Track Up, North Up or Heading Up.

Extended TRK: Turns on or off the extended track line, which is drawn ahead of the present position in the direction of the present track.

Range Rings: Turns range rings on or off on the map.

Airport Settings: Selectable airport filtering for display on the map.

Min Rwy Len: Minimum Runway Length allows the display of airports on the map based on minimum runway length. This can be set to **Any** or **1000 ft** to **5000 ft** in 100 foot increments.

Surface: Allows the display of airports on the map based on **Any** surface or **Hard** surface only.

Label: May be set to display the airport on the map with **ICAO** identifier, the airport **Name** or **City**.

All settings on **MAP SETTINGS GROUP 1** affect all map displays for all functions. Settings on **GROUP 2** through **6** affects only the displays for the currently viewed function.

2. Press the **NEXT GROUP** Softkey to display the **AVIATION ICON GROUP** Page as in Figure 1-164.

VFR Map aviation related icons are shown with corresponding definitions.

The next series of menus allows customizing of the Map Displays to show the amount of data desired for ease of readability at various display ranges.

The maximum range settings at which the **ICON**, **LINE** and/or **TEXT** is displayed on the map may be selected for each category. Use the Joystick to select the desired field and turn the Rotary Knob to change the setting.

3. Press the **NEXT GROUP** Softkey to display the **AVIATION LINE GROUP** Page as in Figure 1-165.

VFR Map aviation related lines are shown with corresponding definitions.

The database filters airspace first by class, then by type. If the class is not known and the type does not fit into one of the categories, it will be displayed as **Unknown**.

Other SUA types are Radar Area, Alert, Caution, Training, Warning or Unspecified.

Figure 1-164

Figure 1-165

Figure 1-166

Again, use the Joystick to select the desired field and turn the Rotary Knob to change the setting.

NOTE: Class A, E, F and G airspace will not be shown in the United States, but are in the international data.

4. Press the **NEXT GROUP** Softkey to display the **LAND ICON GROUP** Page as in Figure 1-166.
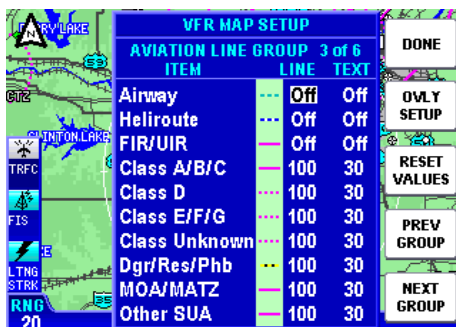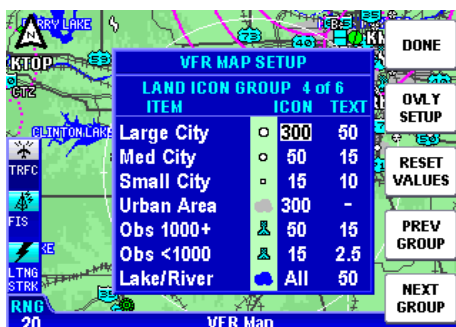
VFR Map land related icons are shown with corresponding definitions.

As before, use the Joystick to select the desired field and turn the Rotary Knob to change the setting.

5.   Press the **NEXT GROUP** Softkey to display the second **LAND LINE GROUP** Page as in Figure 1-167.
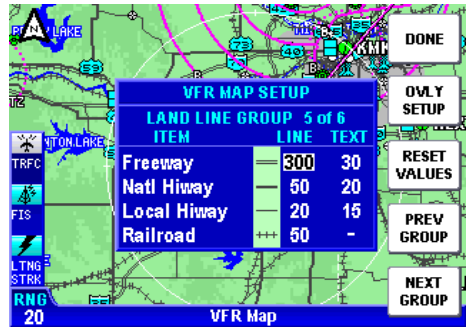
Figure 1-167

Again, use the Joystick to select the desired field and turn the Rotary Knob to change the setting.

6.   Press the **NEXT GROUP** or **OVLY SETUP** Softkey to display the **OVERLAYS GROUP** Page as in Figure 1-168.

Overlay icons are shown with corresponding definitions.
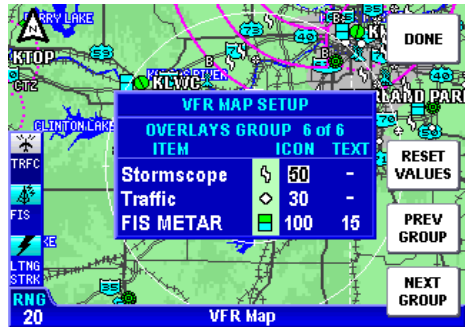
Figure 1-168

NOTE: Some functions may not be available in certain installations. Unavailable functions will appear gray with dashes for values and will not be selectable.

If Stormscope, a Traffic Avoidance System and/or Flight Information Services have been installed, control of how the data is displayed (or not displayed) on the map is accomplished on this page. The maximum range settings at which the **ICON** and **TEXT** is displayed on the map may be selected for each function. Use the Joystick to select the desired field and turn the Rotary Knob to change the setting.

7.   Press the **DONE** Softkey when Map Setup is complete.

NAVIGATION SETUP

1.   Press the **MENU** Key to display Figure 1-169.

2.   Press the **AUX MENU** Softkey to display Figure 1-170.

3.   Use the Joystick to select **Navigation Setup** then press the **SELECT** Softkey to display the first the **NAV DATA SET-TINGS** Page as in Figure 1-171.

4.   Use the Joystick to select the desired item and use the Rotary Knob to change the value.
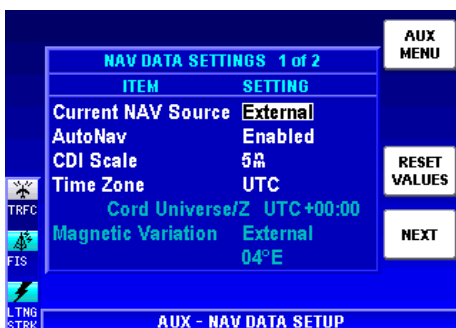
Current NAV Source 🌐: Used to select the navigation source in units with the optional internal GPS. Can be set to **Internal GPS** or **External**. Options are dependent on installation configuration.

AutoNav 🌐: If the KMD 250 is installed to function with an external GPS source, such as a KLN 94, and KMD 250 has the optional internal GPS, the system is capable of automatically switching from the external GPS source to the internal GPS when situations dictate. When AutoNav is enabled, this

Figure 1-169

Figure 1-170

Figure 1-171

allows the system to prompt the user for a change in navigation source if valid position data is not being received from the external source. The flight plan will be copied from the external navigation source to the KMD 250 active flight plan. Navigation displayed will be limited to VFR only as annunciated by **INTERNAL VFR GPS**. Options are dependent on installation configuration.

CDI Scale: Used to set the sensitivity of the Course Deviation Indicator when being viewed in a Data Field. Options are 5nm, 1nm or .3nm.

NOTE: The 0.3 nm scale could result in overly active roll performance depending upon the particular autopilot installation. Use of the 1 nm or 5 nm CDI scale may be preferred during autopilot operation.

Time Zone: Selection determines the time displayed in any time related Data Field. The next line gives a description of the abbreviation and the offset from UTC time. When Local Time is selected the UTC offset field will be an entry field to input the local offset value. The following is a list of the available **Time Zone** options:

UTC	Coordinated Universal Time/Zulu	
GST	Greenland Standard Time	UTC-3
GDT	Greenland Daylight Time	UTC-2
ATS	Atlantic Standard Time	UTC-4
ATD	Atlantic Daylight Time	UTC-3
EST	Eastern Standard Time	UTC-5
EDT	Eastern Daylight Time	UTC-4
CST	Central Standard Time	UTC-6
CDT	Central Daylight Time	UTC-5
MST	Mountain Standard Time	UTC-7
MDT	Mountain Daylight Time	UTC-6
PST	Pacific Standard Time	UTC-8
PDT	Pacific Daylight Time	UTC-7
AKS	Alaska Standard Time	UTC-9
AKD	Alaska Daylight Time	UTC-8
HAS	Hawaii Standard Time	UTC-10
HAD	Hawaii Daylight Time	UTC-9
SST	Samoa Standard Time	UTC-11
SDT	Samoa Daylight Time	UTC-10
LCL	Local Time	User entered in 1/2 hour increments

Magnetic Variation: The magnetic variation used for navigation calculations. Options are **Auto**, **Manual** or **External** depending on installation configuration. When **Manual** is selected, the offset can be entered using the Rotary Knob.

5. Press the **NEXT** Softkey to display the second **NAV DATA SETTINGS** Page as in Figure 1-172.

Position Format: Determines whether position information is displayed with reference to **Lat/Lon** (Latitude/Longitude), **UTM** (Universal Transverse Mercator) or **OSGB** (Ordinance Survey of Great Britain) in the **PPOS** Data Field. This will also affect the **PBRG** and **PDIS** data when the Joystick Pointer is active.
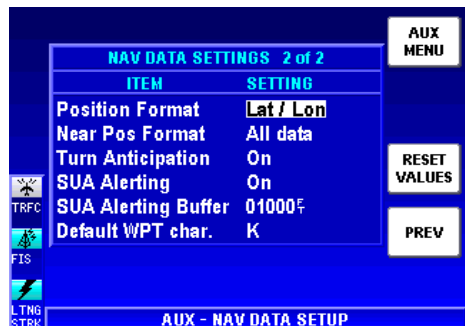
Figure 1-172

Note: OSGB is only defined for Great Britain.

Near Pos Format: Determines parameters used to display the near position reporting when viewed in a Data Field. Can be set to **Airports+VORs**, **VORs only** or **All data**.

Turn Anticipation: When turned on, turn guidance to a new course is provided along an arc.

SUA Alerting: When turned on, a Special Use Airspace Alert Message will be annunciated when the aircraft is approximately 10 minutes or two miles from entering the airspace.

SUA Alerting Buffer: Defines the altitude boundary for the Special Use Airspace at which the Alert Message is annunciated. Can be set from 300 feet to 59900 feet in 100 foot increments.

Default/WPT Char.: Defines the default first character displayed in way-point data entry fields. Use the Rotary Knob to enter the desired alphanumeric character.

6. Press the **AUX MENU** Softkey to return to the first **NAV DATA SET-TINGS** Page. Now press the **DONE** Softkey to exit the setup.

DEMO MODE & SETUP

A great way to become familiar with all the features of the KMD 250 is to use it's built in Demo Mode. When the KMD 250 is in the Demo Mode, it performs as if it is receiving adequate sensor signals to use the various functions. Units without the optional internal GPS, a pre-programmed flight plan determined by the database type being used can be navigated. Units containing the optional internal GPS can navigate any user programmed waypoints or flight plans.

In order for the KMD 250 to function in the Demo Mode it must be used in conjunction with a product such as the Commander 2900 from Lone Star Aviation.

For more information on the Commander 2900-KMD 250, or to place an order, contact:

Lone Star Aviation, Inc.
604 Wisteria Street
Mansfield, TX 76063
Phone: (682) 518-8882
FAX: (682) 518-8831
www.lonestaraviation.com

The KMD 250 is automatically put into Demo Mode when it is used with a Commander 2900. In addition, an authorized Honeywell Service Center may also arrange for you to put the KMD 250 into Demo Mode by grounding the appropriate pin at the back of the unit while it is removed from the aircraft and is connected to an appropriate power supply. The KMD 250 must never be put into the Demo Mode when it is installed in the aircraft.

After power-up is complete Figure 1-173 will be displayed. Press the **DEMO MODE** Softkey and Figure 1-174 will be displayed. Press the **OK** Softkey to acknowledge the caution.

Press the **OK** Softkey to acknowledge the next caution displays as in previous discussions.
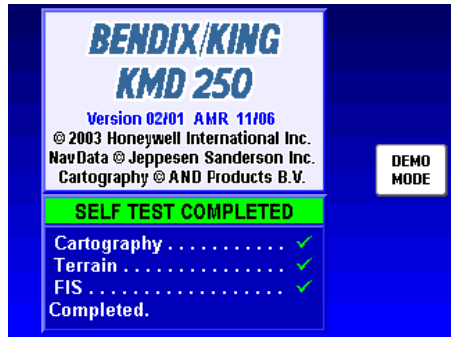
Figure 1-173

DEMO MODE FOR NON-GPS VERSIONS

If KMD 250 does not have the optional internal GPS it will begin navigating a simulated flight plan that is stored on each of the three different types of data cards as shown in Table 1-4.

In this example the AMR database is installed, therefore,

Figure 1-174

Figure 1-175 shows the pre-programmed flight plan for KIXD to KOSH.
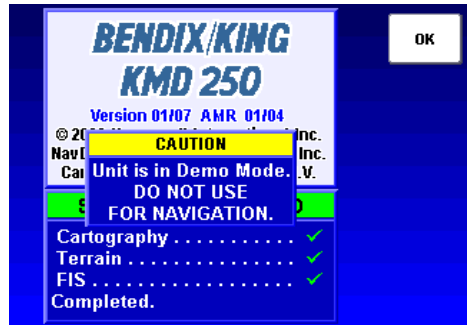
Database Type	Starting Waypoint	Destination Waypoint
AMR (Americas)	KIXD	KOSH
PAI (Pacific International)	YSSY	YBBN
ATI (Atlantic International)	EGHD	EGNJ

Table 1-4 Demo flight plan Waypoints

The system defaults for Demo Mode will automatically start the demo at the beginning waypoint for the flight plan stored in the data card. The simulated flight will be at an altitude of 2000 feet and groundspeed will be 135 knots. Track and heading will be equal.
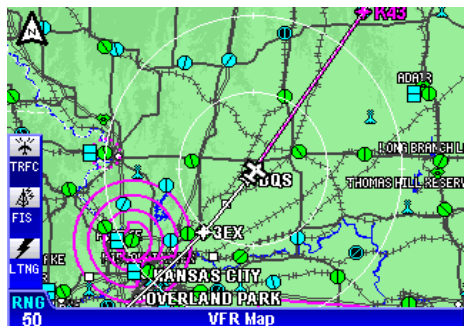
Figure 1-175

DEMO MODE FOR GPS VERSIONS

If the KMD 250 contains the optional internal GPS, way-points and flight plans may be created, stored and navigated in the Demo Mode. After entering Demo Mode refer to previous discussions for opera-tion of the KMD 250.
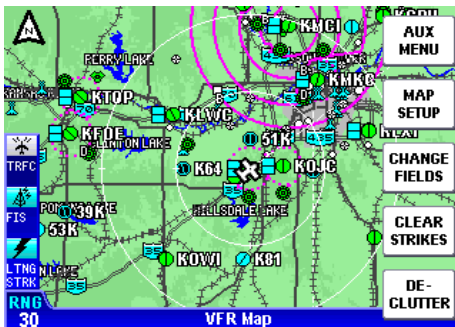
Figure 1-176

CHANGING DEMO MODE SETTINGS

To modify the Demo Mode set-tings, perform the following steps:

1. Press the **MENU** Key to dis-play the **AUX MENU** Softkey as in Figure 1-176.

2. Press the **AUX MENU** Softkey to display Figure 1-177. If necessary, use the Joystick to highlight **Demo Mode Setup** as shown.

Figure 1-177

3. Press the **SELECT** Softkey to display Figure 1-178. In ver-sions without the optional internal GPS, the default **Mode** setting is **Auto**. When **Auto** is selected, all other parameters will be "grayed out". To change the other parameters, turn the Rotary Knob to select **Manual** in the **Mode** field. The Joystick may now be used to select the desired field. Turn the Rotary Knob to enter the desired values.
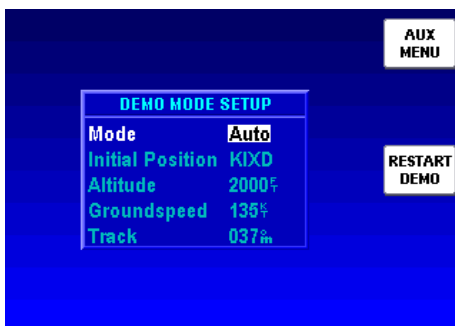
Figure 1-178

In versions containing the optional internal GPS, **Mode** is not available and all fields are selectable and editable.

4. When finished making changes, press the **RESTART DEMO** Softkey to begin the demo using the new parameters.

SOFTWARE VERSIONS

The current unit software version may be checked by performing the following steps:

1. Press the **MENU** Key to display the **AUX MENU** Softkey as in Figure 1-176.

2. Press the **AUX MENU** Softkey to display Figure 1-179. If necessary, use the Joystick to highlight **Software Versions** as shown.

3. Press the **SELECT** Softkey to display Figure 1-180.
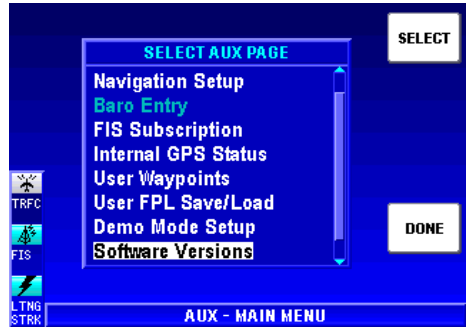
Figure 1-180

DATABASE VERSIONS

The current database version may be checked by performing the following steps:

1. Press the **MENU** Key to display the **AUX MENU** Softkey as in Figure 1-176.

2. Press the **AUX MENU** Softkey to display Figure 1-181. If necessary, use the Joystick to highlight **Database Versions** as shown.

3. Press the **SELECT** Softkey to display Figure 1-182.

*NOTE: For a VDL installation, if a new datacard is not installed before the date shown under **SUBSCRIPTION DATA,,** the KMD 250 will no longer receive FIS subscriptions even if the FIS subscriptions are current. A new datacard is only required on initial XM installations, not for later database updates.*
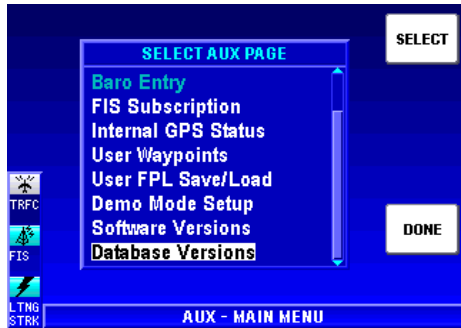
Figure 1-181
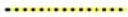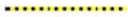
Figure 1-182

MAP DISPLAY ICONS

The following table shows the map display icons and their meanings:

Map Icon	Conditions	Icon / Shape (dark gray or black backgrounds are transparent areas)	Color	Characteristics
Urban Areas			Light gray region.	
Oceans / Lakes			Blue region.	Labeled with their name.
Rivers			Blue line or region.	Labeled with their name.
Political Boundary Lines			Dashed white line.	When the 500 nm Range or greater is selected, the name of the political region shall be displayed with a white on black label.
Railroad (Railway) Lines			Dark gray line with hack marks.	Cyan on the IFR Map.
Roads	Interstate Highway		Double dark gray line.	Cyan on the IFR Map.
	National Highway		2 pixel wide dark gray line.	Cyan on the IFR Map.
	Local Highway		Single pixel wide dark gray line.	Cyan on the IFR Map.
	Interstate Highway Icon (U.S.)		Cyan and white icon with black border.	Interstate highways will be labeled with this icon.
	National Highway Icon (U.S.)		Cyan icon with black border.	National highways will be labeled with this icon.
	Local Highway Icon (U.S.)		Cyan icon with black border.	Local highways will be labeled with this icon.
	Motorway Icon (ATI, PAI)		Cyan icon with black border.	International Motorways will be labeled with this icon.
	Main Road Icon (ATI, PAI)		Cyan and black icon with black border.	International Main Roads shall be labeled with this icon.
	Local Road Icon (ATI, PAI)		Cyan icon with black border.	International Local Roads shall be labeled with this icon.
Low Altitude Airways		V508	2 pixel wide dashed dark cyan line.	The Airway will be labeled with the airway identifier.
Heliroutes		HARBOR FR	Dashed 2 pixel wide blue and white line.	The heliroute will be labeled with the heliroute name when the data is available in the database.

Section 1
Basic Operation

Map Icon	Conditions	Icon / Shape (dark gray or black backgrounds are transparent areas)	Color	Characteristics
Airspace Boundary	FIR/UIR		Solid magenta 2 pixel wide line.	The boundary label will be "FIR", "UIR" or "F/U" as appropriate for the airspace type.
	Class A / B / C		Solid magenta 2 pixel wide line.	The boundary label will be "A" or "B" or "C" as appropriate for the airspace type.
	Class D		Magenta dotted 1 pixel wide line.	The boundary label will be "D" as appropriate for the airspace type.
	Class E / F / G		Magenta dotted 1 pixel wide line.	The boundary label will be "E" or "F" or "G" as appropriate for the airspace type.
	Class Unknown		Magenta dotted 1 pixel wide line.	The boundary will not be labeled.
	Restricted/Danger		Yellow and Black dashed 2 pixel wide line.	The boundary label will be "RES" or "DGR" as appropriate.
	Prohibited		Yellow and Black dashed 2 pixel wide line.	The boundary label will be "PHB".
	MOA / MATZ		Solid magenta 2 pixel wide line.	The boundary label will be "MOA" or "MATZ" as appropriate for the airspace type.
	Other SUA (Radar Area, Alert, Caution, Training, Warning or Unspecified)		Solid magenta 2 pixel wide line.	The boundary label will be "RAD", "ALT", "CTN", "TNG", "WNG" or "UNS" as appropriate for the airspace type.
Cities	Large City		White icon with black border.	This icon will be used for cities with population more than 100,000. The icon will be labeled with the city name.
	Medium City		White icon with black border.	This icon will be used for cities with more than 20,000, but less than 100,000. The icon will be labeled with the city name.
	Small City		White icon with black border.	This icon will be used for cities with population less than 20,000. The icon will be labeled with the city name.

Map Icon	Conditions	Icon / Shape (dark gray or black backgrounds are transparent areas)		Color	Characteristics
Intersections (INTs)		Low Range	High Range		The label will indicate the intersection identifier.
		▲	▲	Green icon with black border.	
Obstacles	All types at High Range scale.	♠		Cyan icon with black border.	The label will indicate the MSL elevation followed by the AGL elevation in parentheses (e.g. "1546 (590)").
	Lighted - Tall at low range scale.	♙		Cyan icon with black border.	
	Lighted - Short at low range scale.	♟		Cyan icon with black border.	
	Unlighted - Tall at low range scale.	♟		Cyan icon with black border.	
	Unlighted - Short at low range scale.	♠		Cyan icon with black border.	
NDBs		Low Range	High Range		The label will indicate the NDB's identifier.
		✿	✦	Green icon with black border.	
VORs	With DME	Low Range	High Range		The label will indicate the VOR's identifier.
		✿	✦	Green icon with black border.	
	Without DME	◉	●	Green icon with black border.	
Airports	Airport with hard runway and IFR approach.	Low Range	High Range		When enabled, the airport label will identify the ICAO code, City name or airport name based on the setting on the Map Setup page.
		◐	●	Solid green circle with black border. Black line represents primary runway orientation.	
	Airport with soft runway and IFR approach.	⊜	●	Hollow green circle with black border. Green line represents primary runway orientation.	
	Airport with unknown runway type and IFR approach available.	●	●	Solid green circle with black border.	
	Airport with hard runway and no IFR approach.	◐	●	Solid cyan circle with black border. Black line represents primary runway orientation.	
	Airport with soft runway and no IFR approach.	⊜	●	Hollow cyan circle with black border. Cyan line represents primary runway orientation.	
	Airport with unknown runway type and no IFR approach available.	●	●	Solid cyan circle with black border.	

Map Icon	Conditions	Icon / Shape (dark gray or black backgrounds are transparent areas)		Color	Characteristics
Airport Runways	Primary, hard surface.			Thick white line with black border.	Runways will be depicted for Airports when the selected range is 5 nm or less and the display of airport icons is enabled for the current range on the Map Setup page. Runway ends will be labeled with the proper runway identifier if the selected range is less than 5 nm.
	Other hard surface.			Thin white line with black border.	
	Primary, soft surface.			Thick green line with black border.	
	Other soft surface.			Thin green line with black border.	
Helipads		Low Range	High Range		The label will indicate the helipad name.
		⊞	⊗	White circle with black border and black letter "H".	
Visual Reference Points		⊕		White icon with black border and black cross.	The label will indicate the VRP name.
Present Position (with HDG or TRK)		✛		White airplane icon with double thick black border.	Icon rotates with aircraft heading or track.
Present Position (no HDG or TRK)		✪		White cross with black border.	This icon indicates present position when no heading or track is available.
Lightning overlay icon		⚡		White lightning bolt with black border.	
Traffic icon		+08 ● +10 ◇ ◆↓ -10		White, yellow, or red traffic icon.	
Graphical METAR		▯		METAR icon with black border.	
Active flightplan leg		▭		3 pixel wide magenta line with black border.	
Inactive flightplan leg		▭		3 pixel wide white line with black border.	Curved flight plan segments such as holding patterns and DME arcs will be shown using this line style.
Flightplan Waypoint		✧		White cross icon with black border.	
Track Line		-------		Thin white dotted line.	The track line will indicate the current aircraft track.
North Pointer		△N		White pointer with black border and labeled with black "N".	This icon will rotate to always indicate the direction to True North. Colors will be inverted on maps with black backgrounds.
Range Rings		⌒		Single pixel white line.	Range rings will be drawn indicating the selected map range and half map range.
Joystick Pointer		▸		Black pointer with white border.	Displayed when joystick is active.

DATACARDS

DATA AREAS

Honeywell produces three datacards based on the ICAO/ARINC geographic areas for the KMD 250 that cover the entire world. Each card for each area contains the operating software, the appropriate Jeppesen aeronautical data, cartographic data and topological data to a high resolution. Also included is a low resolution map of the rest of the world.
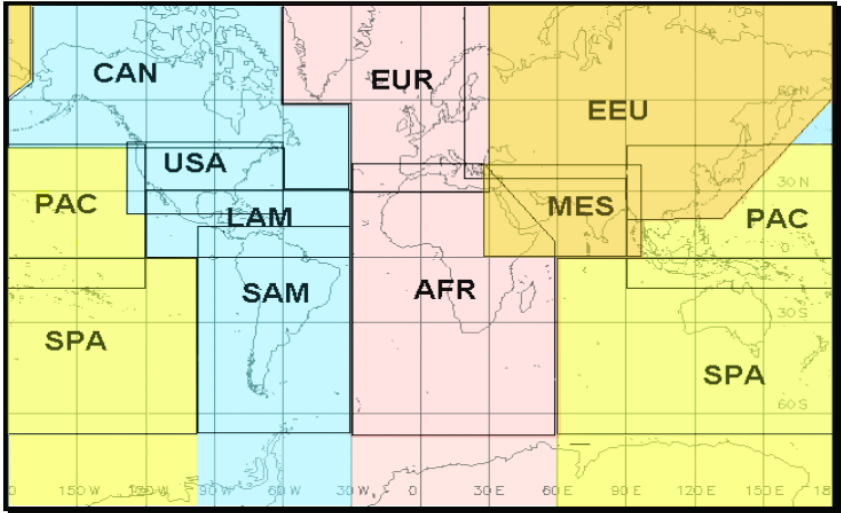
The ten ICAO/ARINC areas along with their three letter identifiers are:

AFR Africa   **CAN** Canada   **EEU** Eastern Europe

EUR Europe   **LAM** Latin America   **MES** Middle East

PAC Pacific   **SAM** South America   **SPA** South Pacific

USA USA

These areas are combined to produce three data cards covering the entire world that contain the following data:

AMR Americas - comprising CAN, USA, LAM, SAM

ATI Atlantic International - comprising EUR, AFR, EEU, MES

PAI Pacific International - comprising PAC, SPA, EEU, MES

INSERTING A NEW DATACARD

Each KMD 250 Database cycle will result in the necessity to load a new database when using the database subscription service. This is done by inserting a new datacard.

NOTE: Since all user waypoints and flight plans are stored on the datacard, it will be necessary to transfer this data to the new datacard.

The following displays depict those seen on a KMD 250 containing the internal GPS.

To change the datacard follow these steps:

1. Turn off the KMD 250.

2. Push in the datacard until it clicks, then release. The datacard should now slide straight out.

3. With the new card facing upward, as indicated on it's label, insert the new datacard until it clicks. The new datacard is now locked in place.

4. Turn the unit on and, if necessary, wait for the new software to load.

5. Figure 1-183 will be displayed to allow flight plans and waypoints stored on the previous datacard to be moved to the new datacard. Press the **YES** Softkey to move stored data. Other wise press the **NO** Softkey.

6. After pressing the **YES** Softkey, Figure 1-184 will be displayed. As directed, remove the new datacard and re-insert the old datacard.

7. When Figure 1-185 is displayed re-insert the new datacard.
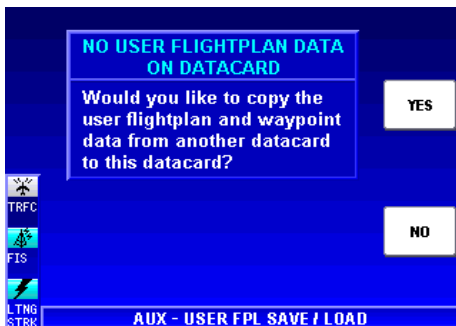
Figure 1-183
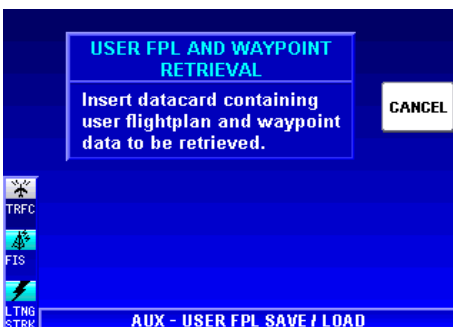
Figure 1-184
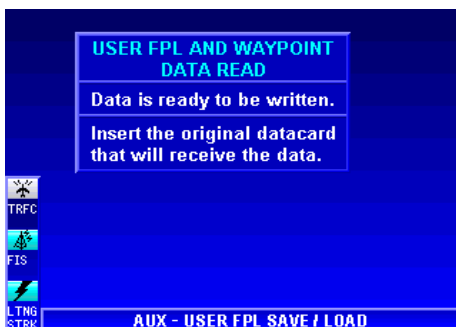
Figure 1-185

8. The flight plans and way-points are now written to the new card as shown in Figure 1-186. Press the **OK** Softkey.

NOTE: In units that do not contain the internal GPS, references to flight plans will not be displayed. For example the title of the window in Figure 1-186 will be "USER WAYPOINT DATA STORED".
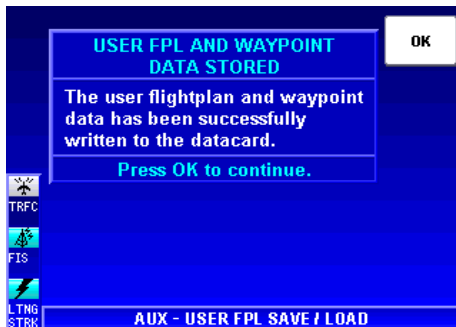
Figure 1-186

TRANSFERRING DATA BETWEEN DATACARDS

User stored data such as flight plans and waypoints can be moved between datacards.

The following displays depict those seen on a KMD 250 containing the internal GPS.
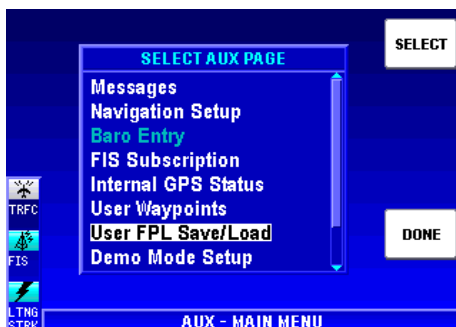
STORE CURRENT USER DATA ON ANOTHER DATA-CARD

To move from one datacard to another, perform the following steps:

1. Press the **MENU** Key.

2. Press the **AUX MENU** Softkey to display Figure 1-187. Use the Joystick to highlight **User FPL Save/Load** as shown.

Figure 1-187

Figure 1-188

3. Press the **SELECT** Softkey to display Figure 1-188.

4. If necessary, use the Joystick to highlight **Store current user data on another datacard**.

5. Press the **SELECT** Softkey.

1-97
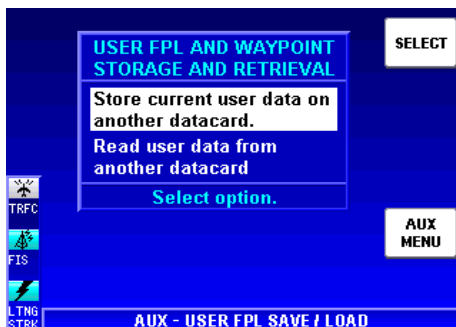
6. When Figure 1-189 is displayed, insert the datacard to which the data will be copied.

7. After the datacard is inserted, the data will be copied and Figure 1-190 will displayed indicating the data was copied successfully.
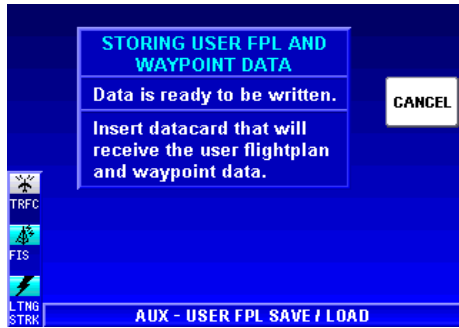
8. Re-insert the original datacard.

NOTE: In units that do not contain the internal GPS, references to flight plans will not be displayed. For example the title of the window in Figure 1-190 will be "USER WAYPOINT DATA STORED".

RETRIEVE USER DATA FROM ANOTHER DATA-CARD

To move from one datacard to another, perform the following steps:

1. Press the **MENU** Key.

2. Press the **AUX MENU** Softkey to display Figure 1-191. Use the Joystick to highlight **User FPL Save/Load** as shown.
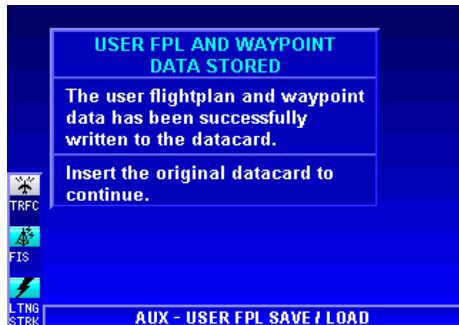
Figure 1-189

Figure 1-190

Figure 1-191

3. Press the **SELECT** Softkey to display Figure 1-192.

4. If necessary, use the Joystick to highlight **Read user data from another datacard**.

5. Press the **SELECT** Softkey.

6. When Figure 1-193 is displayed, insert the datacard containing the data to be copied.

7. After the datacard is inserted, the data will be read and Figure 1-194 will displayed indicating the data is ready to be copied.

8. Re-insert the original datacard that will receive the data.

9. Figure 1-195 will be displayed indicating data on the datacard will be overwritten.

10. Press the **OK** Softkey to overwrite.
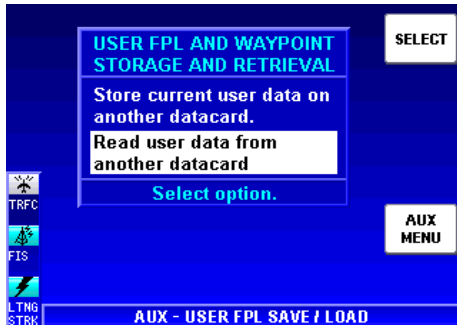
Figure 1-192
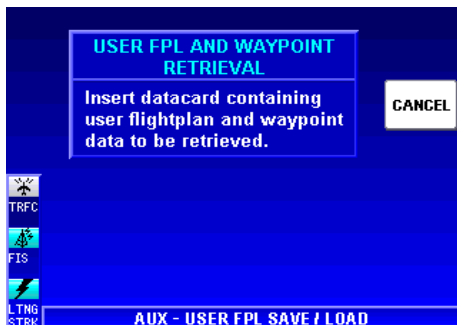
Figure 1-193
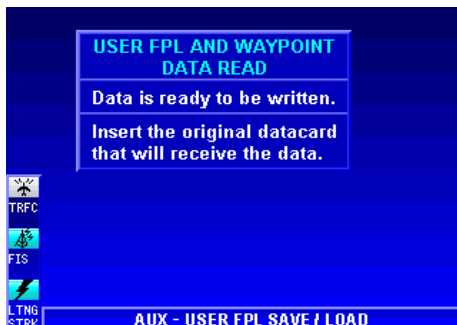
Figure 1-194
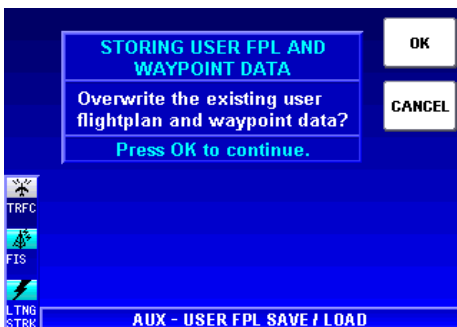
Figure 1-195

11. Figure 1-196 will be displayed showing that the data has been stored on the datacard.

12. Press the **OK** Softkey to continue.

NOTE: In units that do not contain the internal GPS, references to flight plans will not be displayed. For example the title of the window in Figure 1-195 will be "STORING USER WAYPOINT DATA".
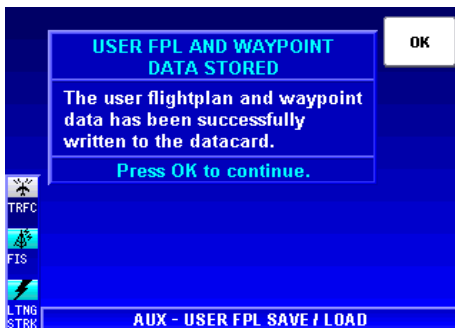
Figure 1-196

DATABASE INFORMATION

Due to Honeywell's policy of continual development and routine database updates, new VDL datacards will become available every 28 days. As a registered owner of a KMD 250, you will be offered a 1/3/6/12 monthly datacard subscription.

DATABASE CYCLE INFORMATION

Keeping the database current in the KMD 250 is the user's responsibility. Honeywell maintains its VDL databases to be current at all times to the latest Jeppesen 28-day data cycle.

For VDL database subscriptions and FIS subscriptions, contact Wingman Services at the following numbers:

1-800-247-0230 if calling within the United States or Canada

(913) 712-3145 if calling from outside the United States or Canada

(913) 712-3904 FAX

e-mail: nav.database@honeywell.com

Visit Wingman Services at www.bendixking.com

For XM subscriptions, contact XM Radio at 1-800-985-9200 or www.xmradio.com/weather.

SECTION 2
FIS VDL OR XM OPERATION

INTRODUCTION

CONCEPT OF OPERATION

The Flight Information Services (FIS) system supplies real-time weather information and other flight advisory information to pilots to enhance situation awareness.

FIS is not intended to replace voice radio services. Voice communication of weather and meteorological information, in accordance with FAA operating rules, is still required.

Real-time weather is available 24 hours / day, 7 days / week. Two different systems are available for delivery of the weather data: a ground-based VHF Datalink (VDL) network and Baron WxWorx weather delivered via the XM Radio satellite system. Data acquired from FAA approved weather sources is processed and then distributed to VDL Ground Stations and to the XM satellite network. The Ground Stations broadcast the information over a VHF Data Link (VDL) to aircraft within line-of-sight utilizing VDL mode 2 transmitters at a bit rate up to 31.5 kbps. The XM satellite network uses two geosynchronous satellites to broadcast network weather to aircraft at S-band (2.3 GHz) frequencies.

This diagram illustrates how FIS VDL data is received in the aircraft.
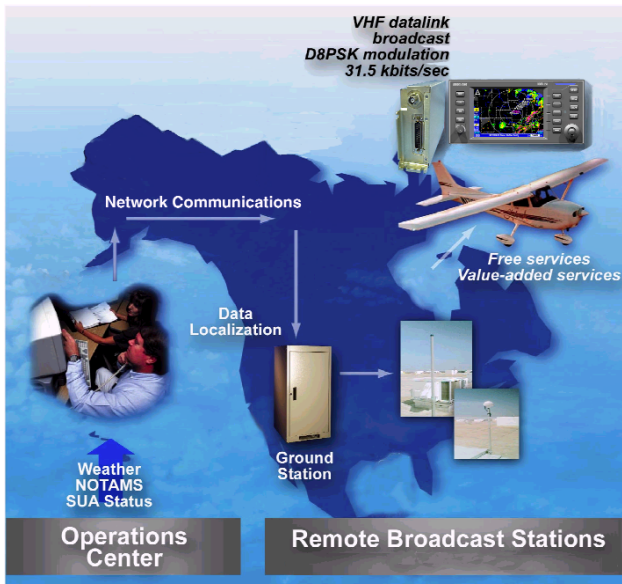
See our website at www.bendixking.com for VDL network status and coverage. Continuous coverage of most of the continental US is possible at altitudes as low as 5,000 ft. AGL, except for regions of precipitous terrain. As with all VHF communications, the line-of-sight range increases with altitude. However, there is no appreciable increase in coverage above 17,500 ft MSL. The following illustration shows how altitude influences FIS VDL coverage.
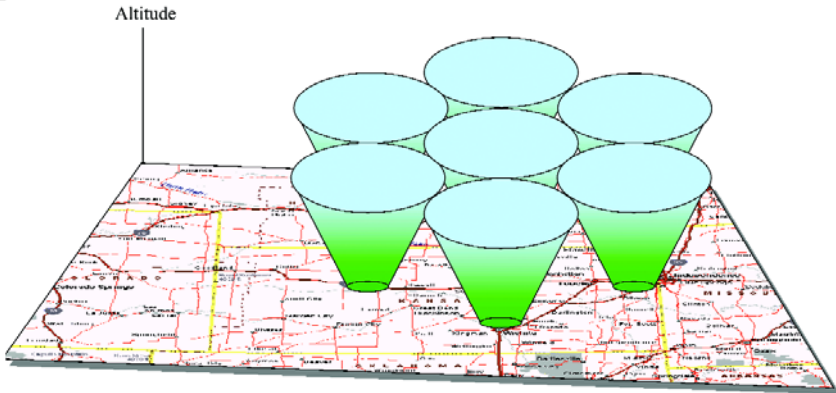
The following diagram illustrates how XM Wx data is received in the aircraft.

The XM Satellite Radio weather system provides continuous coverage down to ground level over the entire continental United States. A good view of the southern horizon must be available in order to receive at least one of the two satellites.

To receive FIS WX products, an aircraft must be equipped with a compatible VDL receiver (KDR 510) or XM receiver (KDR 610), dedicated VHF antenna or satellite antenna, and appropriate display (KMD 250). FIS VDL uses a one-way (ground-to-air) broadcast protocol. XM WX uses one-way (satellite network to air) broadcast protocol. Data is continually broadcast without the need to request information, nor acknowledge receipt.

Both basic (no-cost) and value added fee-based products are transmitted by VDL. Basic VDL products are displayed using standard ICAO/WMO textual format.

No-Cost VDL Subscription	Fee-Based XM Subscription
Aviation Routine Weather Reports (METARs)	Aviation Routine Weather Reports (METARs)
Aviation Selected Special Weather Reports (SPECIs)	Aviation Selected Special Weather Reports (SPECIs)
Terminal Area Forecasts (TAFs)	Terminal Area Forecasts (TAFs)
Pilot Reports (PIREPs)	
AIRMETs	AIRMETs
SIGMETs	SIGMETs
Convective SIGMETs	Convective SIGMETs
Alert Weather Watches (AWWs)	
Fee-Based VDL Subscriptions	
NEXRAD Base Reflectivity	NEXRAD Composite Reflectivity
Graphical METARs	Graphical METARs
Graphical AIRMETs	Graphical AIRMETs
Graphical SIGMETs	Graphical SIGMETs
Graphical Convective SIGMETs	Graphical Convective SIGMETs
Graphical Alert Weather Watches	

The VDL ground station network repetitively broadcasts the same product until either newer data is available or the information has exceeded a pre-determined expiration time. Basic products are broadcast at least once every 5 minutes by the VDL system. Products are broadcast once every 5 - 12 minutes (depending on the product) by the XM system.

NOTE: Due to inherent delays, areas of coverage and relative age and availability of the data that can be experienced, weather data cannot be viewed as an absolute depiction of conditions at a specific location.

EQUIPMENT OVERVIEW

The Datalink Weather Function of the Bendix/King KMD 250 allows for the display and control of textual and graphical weather information received from the Bendix/King KDR 510 VDL Receiver or the KDR 610 XM satellite receiver. The choice of VDL or XM receiver is made during installation. A single display can display only VDL weather or only XM weather, not both.

This section describes the operation of the KMD 250 display and discusses the proper use of the displayed data for strategic weather planning.

The Bendix/King KMD 250 is shown below with the Text METAR Page selected.

CAUTION

Datalink weather information is to be used as a strategic planning tool for pilot decisions on avoiding inclement weather areas that are beyond visual range or where poor visibility precludes visual acquisition of inclement weather. Datalink weather information may be used as follows:

a. To aid the pilot in situational awareness of hazardous meteorological conditions.

b. As a cue to the pilot to communicate with the ATC controller, AFSS specialist, Operator Dispatch, or Airline Operations Control Center (AOCC) to get further information about the current meteorological conditions. In no case should the pilot take any evasive action based solely upon the datalink weather display.

The datalink weather information is intended for assistance in strategic flight planning purposes only and lacks sufficient resolution and updating necessary for tactical maneuvering.

DATALINK WEATHER FUNCTION STATUS ICONS

The Datalink Weather Function Status Icons are located in the lower left of the display. They are used to indicate whether or not the KMD 250 is currently receiving and/or displaying weather information. The following table shows the various icons and their meanings:

VDL Icon	XM Icon	Colors	Description
		Black on a cyan background.	No weather data is currently being received but previously received data is being displayed on the present page.
		Black on a cyan background.	Weather data is currently being received from a signal and displayed on the present page. XM signal is weak.
		Black on a cyan background.	Weather data is currently being received from a signal and displayed on the present page. XM signal is marginal.
		Black on a cyan background.	Weather data is currently being received from a signal and displayed on the present page. XM signal is good.
		Black on gray.	Weather data not being received nor displayed on the present page.
		Black on gray.	Weather data is currently being received from a signal but not displayed on the present page.
		Black on gray with red slash	Fault with connection or data link radio.

Section 2
FIS Operation

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2-6

BASIC SERVICE WEATHER PRODUCTS

The following is a discussion of weather products offered with the basic no-fee VDL service. Accessing and navigating these services will be discussed in detail later in this addendum.

All basic and value-added products (except those identified as VDL only) can also be obtained through a single fee-based XM subscription service.

METAR

A METAR (Aviation Routine Weather Report) describes the specific weather conditions at a particular airport at a given time. The elements of a METAR are in order as follows:

1. Type of report
2. ICAO station identifier
3. Date and time of issue
4. Modifier (AUTO if automated report or COR if corrected observation)
5. Wind
6. Visibility
7. Runway visual range (as required)
8. Weather phenomena
9. Sky condition
10. Temperature/dew point group
11. Altimeter
12. Remarks (as required)

METARs available within the selected range of the selected area will be displayed up to a maximum of 25 reports. These reports are displayed in an encoded textual format. METARs displayed graphically on the map are offered through a subscription service.

NOTE: When a specific element of METAR data is not available, it is omitted from the report. The user must know the sequence of data to recognize omissions. METAR observations older than 120 minutes will be discarded.

See the section on Understanding Textual Aviation Weather Reports, for instructions on decoding textual METARs.

Section 2 FIS Operation

SPECI

A SPECI (Aviation Selected Special Weather Report) is related to the METAR. SPECIs are issued when certain specific conditions or events have been observed at a particular location, usually an airport. A SPECI will contain the same elements as a METAR and will generally be issued for the following reasons:

1. Sudden, extreme changes in wind speed and/or direction.

2. Changes in surface visibility, especially those that change the flying category at the reporting site.

3. Changes in runway visibility above or below 2,400 feet.

4. Appearance or termination of significant weather or natural atmospheric events such as tornados, waterspouts, funnel clouds, thunderstorms, squalls and volcanic eruptions.

5. Changes in precipitation intensity or form.

6. Changes to ceilings when previously reported ceilings were at or below 3,000 feet, or the formation of a ceiling below 3,000 feet. Also, new formation of cloud layers or other obscuring phenomenon that occur below 1,000 feet.

7. Aircraft mishaps.

8. Other meteorological conditions that the agency or the observer determine as critical.

Refer to the section on METARs for an explanation of the elements. The element sequence and content will be the same as those in a METAR report with the exception of the first element denoting report type. "SPECI" will be seen in place of "METAR".

NOTE: When a specific element of SPECI data is not available, it is omitted from the report. The user must know the sequence of data to recognize omissions. SPECI observations older than 120 minutes will be discarded.

Basic service SPECIs are offered in the encoded textual format.

See the section on Understanding Textual Aviation Weather Reports, for instructions on decoding textual METAR/SPECIs.

TAF

A TAF (Terminal Area Forecast) is a statement of expected meteorological conditions at an airport during a specified period of time. Many aspects of the TAF are the same as a METAR. Abbreviations are the same as in a METAR with addition of a few more discussed later. Many

of the data elements are formatted as those in a METAR report. A TAF will contain elements in the following order:

1. Type of report
2. ICAO station identifier
3. Date and time of issue
4. Date and time valid
5. Wind
6. Visibility
7. Weather phenomena
8. Sky conditions
9. Wind shear (as required)
10. Forecast weather change indicator

TAFs available within the selected range of the selected area will be displayed up to a maximum of 25 reports. These reports are displayed in an encoded textual format.

NOTE: TAFs older than the forecast validity period are discarded. Amended or corrected TAFs generated within the issuance period are provided as soon as they are available, and the previous outdated TAF is no longer transmitted.

See the section on Understanding Textual Aviation Weather Reports, for instructions on decoding textual TAFs.

PIREP (VDL ONLY)

A PIREP (Pilot Weather Report) is an observation of conditions at a specific location or along a specific route. These conditions are reported by pilots when communications are established with ground facilities such EFAS, AFSS/FSS, ARTCC or ATC. Abbreviations are the same as in a METAR. Pilots are encouraged to promptly volunteer these reports. A PIREP will contain elements in the following order:

1. Type of message (urgent or routine)
2. Location in relation to an airport or VHF NAVAID
3. Time observed
4. Flight Level (may not always be present)
5. Type of aircraft (may not always be present)
6. Sky cover (may not always be present)
7. Weather conditions (may not always be present)
8. Temperature (may not always be present)
9. Wind direction and speed (may not always be present)

10. Turbulence (may not always be present)

11. Icing (may not always be present)

12. Remarks (may not always be present)

PIREPs available within the selected range of the selected area will be displayed up to a maximum of 25 reports. These reports are displayed in an encoded textual format.

NOTE: PIREPs older than 120 minutes are discarded.

See the section on Understanding Textual Aviation Weather Reports, for instructions on decoding textual PIREPs.

AIRMET

An AIRMET (Airman's Meteorological Information) is an advisory of significant weather that could be hazardous to single engine, light aircraft and VFR pilots. However, parameters are such that the phenomena does not require issuance of a SIGMET. AIRMETs address details regarding IFR, extensive mountain obscuration, turbulence, strong surface winds, icing and freezing levels. AIRMETs are considered widespread because they must either be affecting or forecast to affect an area at least 3,000 square miles. However, during the forecast period, the actual affected area may be much smaller. AIRMETs are issued every six hours and the maximum forecast period is 6 hours. An AIRMET will contain elements in the following order:

1. Forecast Area

2. Report Type

3. Date and time issued

4. Report designation and reason for issuance

5. Validity period

6. Area of coverage

7. Weather phenomenon details.

These reports are displayed in an encoded textual format.

NOTE: AIRMETs may be issued up to 15 minutes prior to the start of the validity period. The system will display the data age as zero until the start of the validity period. AIRMETs older than 360 minutes are discarded. Amended or corrected AIRMETs generated within the issuance period are provided as soon as they are available, and the previous outdated AIRMET is no longer transmitted.

When an AIRMET is cancelled, neither the original report nor the cancelation message can be displayed.

See the section on Understanding Textual Aviation Weather Reports, for instructions on decoding textual AIRMETs.

SIGMET

A SIGMET (Significant Meteorological Information) is an advisory of non-convective weather that is potentially hazardous to all aircraft. SIGMETs address details regarding severe icing not associated with thunder-storms, severe or extreme turbulence not associated with thunderstorms, dust or sand storms lowering visibility to less than 3 miles, volcanic ash. SIGMETs are considered widespread because they must either be affecting or forecast to affect an area at least 3,000 square miles. However, during the forecast period, the actual affected area may be much smaller. SIGMETs are issued as needed and the maximum fore-cast period is 4 hours, except for 6 hours for conditions associated with hurricanes. A SIGMET will contain elements in the following order:

1. Forecast Area
2. Report Type
3. Date and time issued
4. Report designation and reason for issuance
5. Validity period
6. Area of coverage
7. Location of weather phenomenon
8. Weather phenomenon details.

These reports are displayed in an encoded textual format.

NOTE: SIGMETs older than the forecast period are discarded. Amended or corrected SIGMETs generated within the issuance period are provided as soon as they are available, and the previous outdated SIGMET is no longer transmitted.

When an SIGMET is cancelled, neither the original report nor the cancelation message can be displayed.

See the section on Understanding Textual Aviation Weather Reports, for instructions on decoding textual SIGMETs.

CONVECTIVE SIGMET

A Convective SIGMET (Convective Significant Meteorological Information) is an advisory of convective weather that the forecaster believes hazardous to all aircraft. Convective SIGMETs address details regarding severe thunderstorms, embedded thunderstorms, a line of

thunderstorms, or thunderstorms producing heavy precipitation affecting an area 40 percent or more of an area at least 3,000 square miles. Convective SIGMETs are issued hourly with a maximum forecast period of 2 hours. A Convective SIGMET will contain elements in the following order:

1.   Region Identifier and issue date and time

2.   Report designator

3.   Validity period

4.   Area of coverage

5.   Location details

6.   Weather phenomena details

NOTE: Convective SIGMETs older than the forecast period are discarded. Amended or corrected Convective SIGMETs generated within the issuance period are provided as soon as they are available, and the previous outdated Convective SIGMET is no longer transmitted.

See the section on Understanding Textual Aviation Weather Reports, for instructions on decoding textual Convective SIGMETs.

ALERT WEATHER WATCHES (VDL ONLY)

Alert Weather Watches (AWW) are Alert Severe Weather Watch Bulletins that describe areas of possible severe thunderstorm or tornado development. These are watches, not warnings; and are issued as needed. Severe weather may not actually develop. An Alert Weather Watch will contain elements in the following order:

1.   Report designation and date and time of issuance

2.   Watch number, reason for issuance, area of coverage and validity period.

3.   Watch coordinates

4.   Forecast

NOTE: Alert Weather Watches older than the forecast period are discarded.

See the section on Understanding Textual Aviation Weather Reports, for instructions on decoding textual Alert Weather Watches.

VALUE ADDED SERVICE WEATHER PRODUCTS

The following is a discussion of weather products offered with the value added VDL subscription service. Accessing and navigating these services will be discussed in detail later in this section.

All basic and value-added products (except those identified as VDL only) can also be obtained through a single fee-based XM subscription service.

NEXRAD

Next Generation Radar (NEXRAD) is formally designated WSR-88D, which stands for Weather Service Radar (Doppler) and was commissioned in 1988.

FIS VDL provides NEXRAD base reflectivity and XM WX provides NEXRAD composite reflectivity. Each NEXRAD ground radar site scan is composed of separate beam scans at several elevation angles for 360 degrees around the site. Base reflectivity is the highest precipitation echo (reflectivity) contained in the lowest NEXRAD radar elevation angle scan (5 degrees). Composite reflectivity provides the highest precipitation echoes within all of the elevation scan angles. The NEXRAD base or composite reflectivity modes provide a display of echo intensity depicted by colors. NEXRAD information is good for identifying precipitation intensity.

This NEXRAD base reflectivity data product content consists of reflectivity measured at the minimum scan angle of 0.5 degree elevation.

CAUTION: NEXRAD data must be used for strategic planning purposes only. Due to inherent delays and relative age of the data that can be experienced, NEXRAD data cannot be used for tactical avoidance of weather.

NEXRAD reflectivity images older than 75 minutes are discarded and no longer displayed.

Figure 2-1 shows a typical NEXRAD display. Political boundaries, rivers, lakes, and oceans are depicted in conjunction with weather.

Figure 2-1

The display range may be changed to zoom in on a specific area to get a more detailed weather picture, or zoom out to display a wider range.
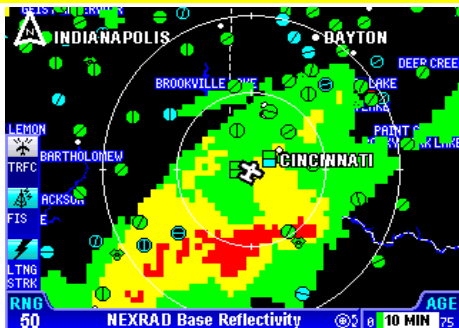
NEXRAD ABNORMALITIES

The following is a list of NEXRAD abnormalities that may be experienced:

1.   Each NEXRAD site can operate in two modes, "Clear Air" mode or "Precipitation" mode. When no significant precipitation exists in the scanning area of the radar a NEXRAD site produces images in the "Clear Air" mode. In this mode the radar is very sensitive to small targets, making it possible to detect minute particles such as pollen, smoke and dust.

2.   Ground clutter is detected when nearby buildings, trees, and towers reflect radar energy back to the NEXRAD site. Because NEXRAD is a Doppler radar, many stationary targets are filtered out. However, if a tower or tree sways slightly in the wind, it will show up on the scan as a target. These "moving" objects are the targets referred to as ground clutter. Radar returns from very near the site (within a radius 20-30 nautical miles) indicating very high reflectivities often include ground clutter.

3.   Strobes are spurious radar data caused primarily by defractive bending of the beam back down to the ground. This often happens in areas where cool air interacts with prevailing warm air, such as along coastlines and over oceans or other large bodies of water. Blocky and linear features are characteristics of strobes within the displayed data.

4.   Sun strobes occur when a radar antenna points directly at the sun. This shows up as high reflectivity for one or two radials. Sun strobes are shown as bright colored spikes on the display.

5.   Military planes deploy metallic dust known as 'chaff' to diffuse their radar signatures and mask their presence on radar. Pilots frequently practice laying chaff trails over open ocean, although these trails often drift over land causing alterations in weather radar scans.

6.   When a solid object, such as a mountain, intersects a radar beam, it blocks any reflectivity beyond that point and produces a shadow within the display.

7.   When a building near a NEXRAD site is taller than the tower on which the radar antenna resides, it can block the beam, casting a long, narrow shadow (blank space) in the display.

8.   NEXRAD sites sometimes return data that is entirely spurious. This is known as "going critical" and usually does not last longer than a few hours.

9.   Atmospheric temperature inversions cause radar returns from the Earth's surface resulting in Anomalous Propagation (AP) echoes on the radar display.

Section 2
FIS Operation

10. Echoes from migrating birds, bats, and insects will be displayed as circular patterns of level 1 reflectivity centered near NEXRAD sites.

11. Significant variation in humidity with altitude can cause reflections from the Earth's surface. These reflections are also displayed as large circular or oval areas of uniform low intensity.

12. Differences will be noted between the base reflectivity (VDL) and composite (XM) products. The base reflectivity product displays the lower extent of cloud masses, so the extent of water droplets appears to be less. The composite product provides more airborne water reflection seen at higher angles as viewed from the NEXRAD ground sites, so higher level features of the convective activity will be given. For example, the "blowout" portion of thunderstorms (the anvil portion) containing high altitude ice particles is often depicted as light precipitation and might be confused for lower altitude light precipitation. Either base or composite product provides an accurate, but somewhat time delayed depiction of high levels of precipitation for fully developed or late stage thunderstorms.

NEXRAD LIMITATIONS

The following are limitations on the use of NEXRAD data:

1. NEXRAD does not provide sufficient information to determine cloud layers or precipitation characteristics (frozen vs. liquid, hail vs. rain, etc.), nor does it provide information on turbulence, only the amount of reflected energy from the precipitation.

2. The displayed NEXRAD product does not provide sufficient detail to infer future weather trends. Due to delays involved in product creation and transmittal, the pilot should always review the age bar to determine information currency.

3. Due to NEXRAD site location limitations, terrestrial blockages and outages, NEXRAD coverage gaps exist. Coverage gaps are displayed as a cross hatched pattern as shown in Figure 2-2. Lack of reflectivity in a coverage gap area should not be construed as a lack of precipitation. Coverage gaps are portrayed identically on either VDL or XM.
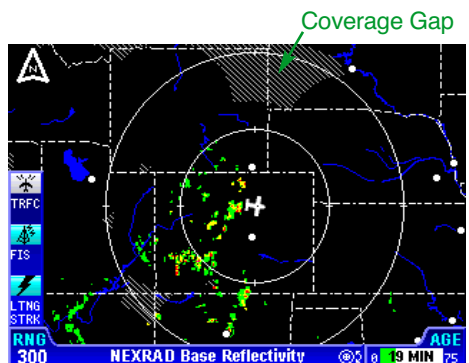
Figure 2-2

4. The resolution of NEXRAD VDL data is 4 kilometers (km). Thus, when zoomed in on the display, each square block is 4 km in diameter. The intensity level reflected by the square will be the highest level sampled within the 4 km area.

5. The resolution of NEXRAD XM data is 2 km. Thus, when zoomed in on the display, each square block is 2 km on a side. The intensity level reflected by the square will be the highest level sampled within the 2 km area.

INTENSITY

Precipitation intensity is depicted using colors as follows:

Green	Light	Level 1	15-30 dBz (10-30 dBz for XM)
Yellow	Moderate	Level 2	30-40 dBz
Red	Heavy	Level 3-4	40-50 dBz
Magenta	Extreme	Level 5-8	50+ dBz

The NEXRAD dBz levels, descriptions and colors are consistent with FAA guidelines.

Moving the joystick and pressing the **LEGEND** Softkey will display the NEXRAD legend as shown in Figure 2-3 (FIS VDL) and 2-4 (XM WX).

The column labeled **dBz** is a measure of the radar echo intensity.

The strength of a radar return signal typically varies as a function of distance (i.e., weaker from distant targets, stronger from those nearby) and the object size.

Many weather sources available on the internet use color coding that is different than the KMD 250 color coding. The dBz and intensity level can be used to compare intensity levels between different sources of NEXRAD information since many internet weather providers will include a legend with dBz values indicated.

No Data, as shown in the legend, indicates the lack of coverage for reasons discussed previously.
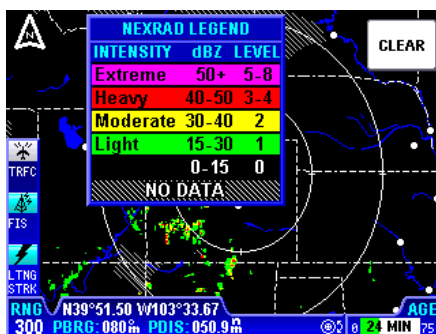
Figure 2-3
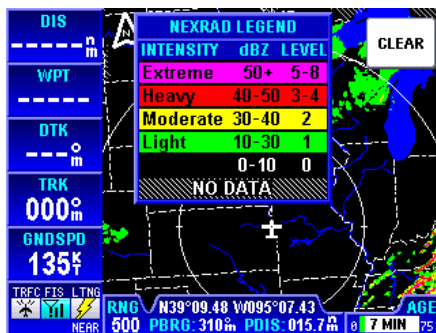
Figure 2-4

GRAPHICAL METAR

The graphical METAR is derived from the most currently received textual METAR or SPECI data from reporting sites. This is displayed on a map background to enhance situational awareness as shown on Figure 2-5.

The graphical METAR icon is gray when the textual METAR or SPECI report exceeds 75 minutes (AGED), but is less than the textual METAR expiration time of 120 minutes. Look at the textual report for ceiling and visibility information.
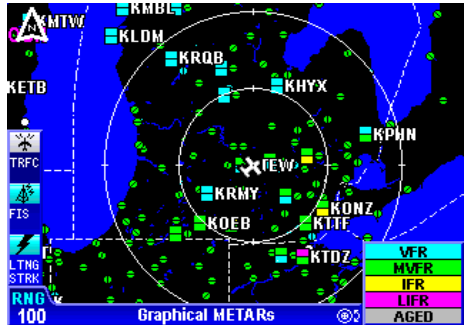
Figure 2-5

CAUTION: Graphical METAR data must be used for strategic planning purposes only. Due to inherent delays, areas of coverage and relative age and availability of the data that can be experienced, Graphical METAR data cannot be viewed as an absolute depiction of conditions at a specific location.

Graphical METARs are shown using two color coded boxes, one indicating ceiling (upper box), the other visibility (lower box). Next to the boxes is the ICAO station identifier for the airport to which the METAR pertains. Color coding for the boxes is specified in the table below:

Cyan	Ceiling > 3000 ft	VFR
Cyan	Visibility > 5 statute miles	
Green	1000 ft ≤ Ceiling ≤ 3000 ft	Marginal VFR
Green	3 sm ≤ Visibility ≤ 5 sm	
Yellow	500 ft ≤ Ceiling < 1000 ft	IFR
Yellow	1sm ≤ Visibility < 3sm	
Magenta	Ceiling < 500 ft	Low IFR
Magenta	Visibility < 1sm	
Gray	Report is older than 75 min	See Text Report for Ceiling and Visibility
Gray	Report is older than 75 min	
Black	Not Reported	Missing Data
Black	Not Reported	

Moving the joystick pointer to an area that will not highlight a specific report then pressing the **LEGEND** Softkey will display the graphical METAR legend as shown in Figure 2-6.
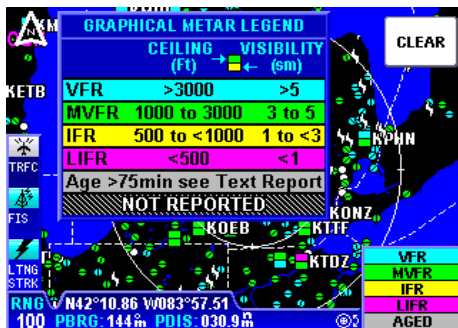
Figure 2-6

GRAPHICAL AIRMET

The graphical AIRMET is derived from the location description (if provided) in the textual AIRMET and displayed as a boundary box with the appropriate color for the condition as shown in the legend (for a description, see AIRMETs in the Basic Weather Services section). The "**IN**" box in the legend indicates the current aircraft position is within the corresponding forecast condition. The boundaries are displayed on a map background to enhance situational awareness as shown on Figure 2-7. Low Level Wind Shear and Freezing Level information will not be displayed on the GRAPHICAL AIRMET; check the textual AIRMETs for this information.

NOTE: If no location description is provided in the textual AIRMET the AIRMET cannot be depicted graphically. These AIRMETs are denoted by displaying the AIRMET identifier in green within the textual AIRMET.
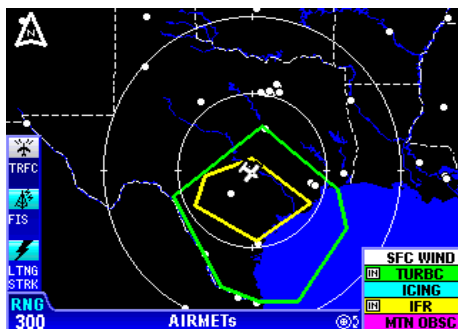
Figure 2-7

GRAPHICAL SIGMET

The graphical SIGMET is derived from the location description in the textual SIGMET and displayed as a boundary box with the appropriate color for the condition (for a description, see SIGMETs in the Basic Weather Services section). This is displayed on a map background to enhance situational awareness as shown on Figure 2-8.
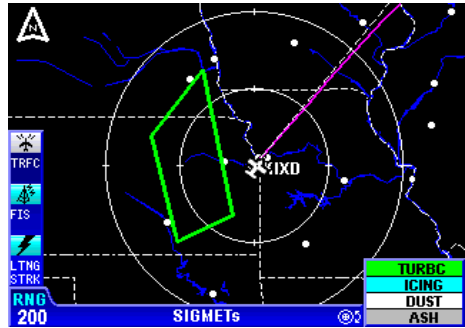
Figure 2-8

GRAPHICAL CONVECTIVE SIGMET

The graphical Convective SIGMET is derived from the location description in the textual Convective SIGMET and displayed as a yellow boundary box (for a description, see CONVECTIVE SIGMETs in the Basic Weather Services section). The "**IN**" box in the legend indicates the current aircraft position is within the corresponding forecast condition. The boundaries are displayed on a map background to enhance situational awareness as shown on Figure 2-9.
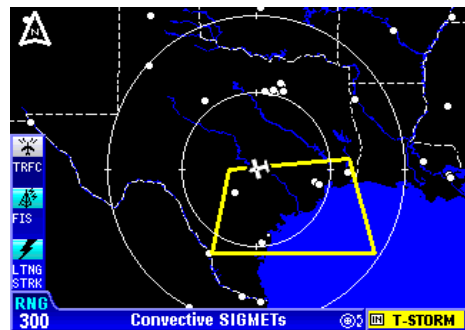
Figure 2-9

GRAPHICAL ALERT WEATHER WATCHES (VDL ONLY)

The graphical Alert Weather Watches (AWWs) are derived from the location description in the textual AWW and displayed as a boundary box with the appropriate color for the condition as shown in the legend (for a description, see ALERT WEATHER WATCHES in the Basic Weather Services section). The "**IN**" box in the legend indicates the current aircraft position is within the corresponding forecast condition. The boundaries are displayed on a map background to enhance situational awareness as shown on Figure 2-10.
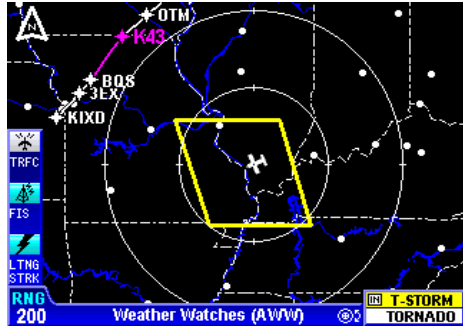
Figure 2-10

SUBSCRIPTIONS

A current subscription (VDL or XM) and a current data card (VDL only) are required to receive services. Subscriptions are used to gain access to services. Some VDL services are offered at no cost and others are fee based. All XM weather services are provided on a fee basis. All services not identified as VDL only are available with an XM subscription.

VDL SUBSCRIPTIONS

Obtaining a VDL subscription can be performed via website, (http://www.bendixking.com) select Wingman Services, Data Link Weather, or alternatively by contacting Wingman Services at 800-247-0230 (or 913-712-3145). During this process, you will have the option to subscribe to fee-based products, such as NEXRAD, Graphical METARs, Graphical AIRMETs, Graphical SIGMETs, Graphical Convective SIGMETs, Graphical AWWs and/or may choose to subscribe to basic textual products, such as TAFs, METARs/SPECIs, PIREPs, AIRMETs, SIGMETs, Convective SIGMETs and AWWs, which are free-of-charge.

NOTE: Although the basic textual products are free of charge, they still require a subscription as well as a current data card to receive the service.

To accommodate users with varying service needs (for example, during different flying seasons over the course of a year), the display unit allows storage for up to four individual subscriptions, in much the same way that a computer can support multiple user accounts with different passwords. Once entered, the display unit manages selection of the appropriate subscription without any operator intervention. A subscription code must be entered into the display unit whenever you add or renew a subscription.

When subscribing for a FIS VDL service package, you may specify the date when service shall commence and the duration. If you subscribe to multiple packages, the start date and duration of each can differ (if desired). For instance, a user may select the free text weather package for an entire year and also choose a graphical weather package for part of the year.

During the subscription process, you will receive 1 to 4 subscription codes which you must enter into your display unit to permit access to all products. A subscription code is an alphanumeric sequence that permits access to the FIS VDL broadcast network in much the same way that a computer password permits access to a computer network. When you subscribe for FIS services, the online system will ask for a FIS Display ID in order to provide you with the subscription code. The FIS Display ID is a unique alphanumeric serial number associated with your display unit. This ID is obtained by viewing the FIS VDL Subscription Status page on your display unit. After obtaining the subscription code (from either

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www.bendixking.com or via a phone call to Wingman Services), enter this code into your display unit. The subscription code tells the display the service(s) to which you have subscribed and for what period of time.

Also, the data card must be updated at least once a year for continuance of FIS subscription service. The validity period for the subscription data on the data card is shown on the FIS Caution page at power on and also on the FIS Subscription Status Page. The data card contains both subscription data that is needed to access FIS products as well as the latest operating software. By updating the data card at least once a year prior to the expiration date you will ensure uninterrupted FIS service and also have the latest version of software to utilize new FIS products as they become available. Note that data card updates are available every 28 days and also include the latest version of Jeppesen navigation data.

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| Get Display ID from unit in airplane | → | Go to Bendixking.com or call 1-800-247-0230 to subscribe to FIS Services | → | Enter Display ID during registration (This is only required first time you subscribe) |

| Select the desired services | → | Receive Subscription Code(s) and print them out | → | Take printed out code(s) to the airplane and enter code(s) on the FIS Subscription Status Page |

| Update Data Card if needed. Update at least once per year to ensure continued FIS Services | → | Enjoy flying with FIS Services! |

How to Subscribe to FIS VDL Services

SETTING UP A FIS VDL SUBSCRIPTION

At least one subscription must be set up, even to receive the no-charge services.   Up to four different concurrent subscriptions can be set up depending on the service packages desired.

NOTE: Entering more than four subscriptions will cause previous subscriptions to be overwritten.

NOTE: The following details require selection of a KDR-510 as the source for datalink weather data.

To set up a subscription, perform the following steps:

1. Press the **MENU** Key to display the **AUX MENU** Softkey as shown in Figure 2-11.

2. Press the **AUX MENU** Softkey to display the **AUX-MAIN MENU** Page as shown in Figure 2-12.

3. Turn the Rotary Knob or move the Joystick to move the cursor to select **FIS Subscription** as shown in Figure 2-12.

4. Press the **SELECT** Softkey to display the **AUX-FIS SUBSCRIPTION** Page as shown in Figure 2-13. On initial subscription setup the subscription window will show only blank spaces as shown in Figure 2-13, unless services were pre-provisioned at the factory. In this case some lines may not be blank. If adding another subscription, one or more previous subscriptions may be displayed with the associated validity period and status.

The unique identifier for the individual KMD 250 is displayed in the **FIS DISPLAY ID** window. The unique ID shown here is **0H100 11KSH**.

Figure 2-11

Figure 2-12

Figure 2-13

Section 2
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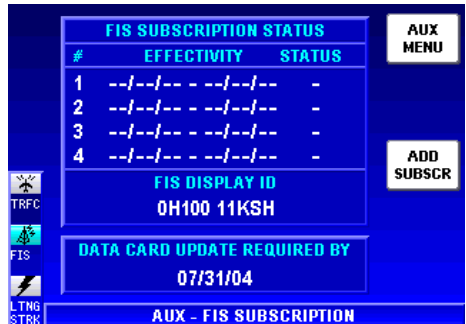
Obtain the unique ID for your system and visit the Wingman Services website on www.bendixking.com or call 1-800-247-0230. This ID will be used to obtain a Subscription Code.

NOTE: For uninterrupted FIS services, the data card must be updated by the date shown in "DATA CARD UPDATE REQUIRED BY" field.
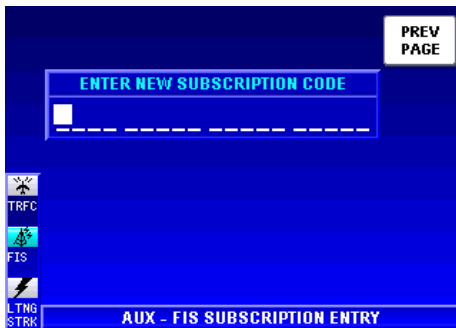
Figure 2-14

5. After obtaining the Subscription Code, press the **ADD SUBSCR** softkey to display Figure 2-14

6. The Rotary Knob selects the alphanumeric character and the Joystick selects the character position. Turn the Rotary Knob until the first character of the Subscription Code is displayed in first space. Push the Joystick to the right to move to the next space to the right. Turn the Rotary Knob until the second character of the Subscription Code is displayed. Continue this sequence until the entire Subscription Code has been entered as shown in Figure 2-15.

After selecting the last character space of the Subscription Code the **ENTER** Softkey will be available.
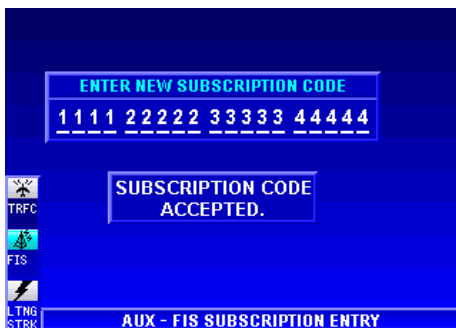
Figure 2-15

Figure 2-16

7. After entering the last Subscription Code character, press the **ENTER** Softkey. The subscription should be accepted and processed as shown in Figure 2-16.

If an incorrect code has been entered, a notification like that shown in Figure 2-17 will be displayed.

8. After the subscription has been accepted, Figure 2-18 will be displayed showing the subscription validity period and status. If the subscription has been entered prior to the beginning of subscription service, the entered subscription will begin when subscription services are turned on.

Figure 2-17

CHECKING FIS VDL SUBSCRIPTIONS

To check FIS VDL subscription validity or status perform the following steps:

1. Repeat steps 1 through 4 in the Setting Up a FIS VDL Subscription section.
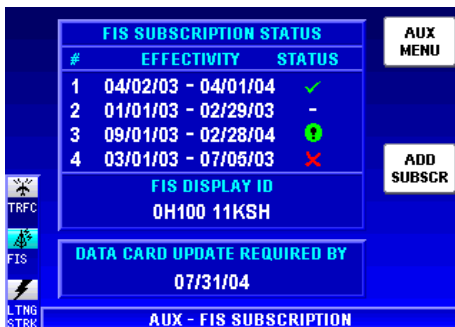
Figure 2-18

2. A screen similar to Figure 2-18 should be displayed. In this case subscription #1 is valid and no other subscriptions have been entered.

The symbols that may appear in the **Status** column, and their meanings, are shown in Figure 2-19. Again, subscriptions will only be valid when FIS subscription service is turned on.

Symbol	Status	Description
—	Unknown	The system time is not known or no subscription is programmed.
🔴	Future	The current system time is prior to the displayed starting date. This subscription is not valid for enabling access to FIS today but it will become valid at some point in the future.
✓	Valid	The current system time is after the displayed starting date and before the displayed ending date.
✓	Almost Expired	The current system time is within seven (7) days of the displayed ending date.
✗	Expired	The current system time is beyond the displayed ending date.

Figure 2-19

NOTE: Only the validity period for subscriptions is shown on the display. To determine which products are available with each subscription, access the account on Wingman Services at www.bendixking.com.

XM WX SUBSCRIPTIONS

An XM subscription must be set up to receive XM WX services. This process involves accessing the XM Radio website and a toll-free phone call to XM Radio.

SETTING UP AN XM WX SUBSCRIPTION

NOTE: The following details require selection of an XM receiver (such as a KDR-610) as the source for datalink weather data.

Setting up an XM WX subscription can be accomplished by following these steps:

1a. Retrieve the 8-digit ID from the KDR 610 label (should be attached to the opposite end of the receiver from the connectors).

OR

1b. Apply power to the display and receiver, select the MENU key and the AUX MENU softkey. The SELECT AUX PAGE is shown on the screen. Scroll down to FIS Subscription so it is highlighted as shown in Figure 2-20. Select the SELECT softkey and record the 8-digit receiver ID displayed at the bottom of the FIS Subscription Status page.

2. Go to the website *www.xmradio.com/weather* to select your weather subscription package.

3. Apply power to the XM receiver, and place the receiver's antenna where the signal can be received from the XM satellites. Make certain the antenna has a good view of the southern horizon.
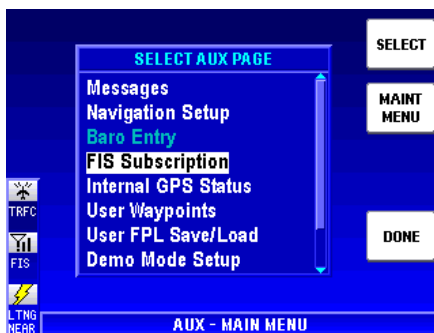
Figure 2-20

4. With the Receiver ID and desired subscription package in hand, contact XM Radio at 1-800-985-9200 for assistance in activating your receiver and setting up a weather product subscription. The receiver should remain in view of the satellites during the subscription process.

5.Verify the activation of the receiver and the subscription validity by selecting and viewing the "FIS Subscription Status Page" on the KMD screen.

If for any reason the receiver was not exposed to the XM signal within the initial 24 hour broadcast period, or is not successfully authorized for some other reason, a subsequent 15 minute resend of the subscription information can be obtained. Get the receiver ID (instructions in step 1a or 1b above), go to the website *http://www.xmradio.com/refresh/*, and

follow the instructions.

CHECKING XM WX SUBSCRIPTIONS

To check the FIS XM subscription and receiver status, apply power to the display and receiver, select the MENU key, then the AUX MENU softkey, which opens the SELECT AUX PAGE. Scroll down to FIS Subscription so it is highlighted, and finally select the SELECT softkey, as in step 1b previously.
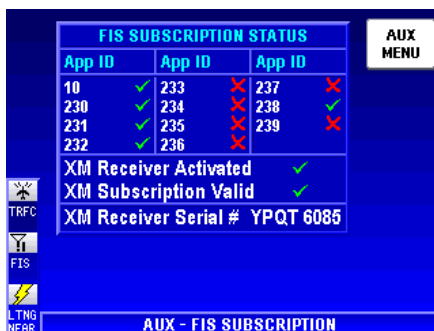
Figure 2-21

The Application IDs are displayed along with the receiver activation and subscription status as shown in Figure 2-21. The Application IDs provide the groupings of products that are part of th subscription package. Green checkmarks indicate those App IDs or product groups that are contained in the subscription package for the XM receiver. Contact XM Radio at 1-800-985-9200 with the App ID information if the subscribed products are not received and displayed.

Symbol	Subscription Status	Description
— (white)	No Information	The XM FIS receiver subscription information message has not been received.
✖	Not Subscribed	The user is not authorized for the Application ID.
✔	Subscribed	The user is authorized for the Application ID.

Intentionally left blank

NORMAL OPERATION

To display the FIS pages, press the **WX** Function Select Key. Each press will cycle through the FIS Graphics Page, FIS Text Page and Stormscope® (if installed).


```
Datalink Wx
Graphical
Products
        |
Datalink Wx
Textual
Products
        |
Stormscope®    *Only if Stormscope® is installed
```
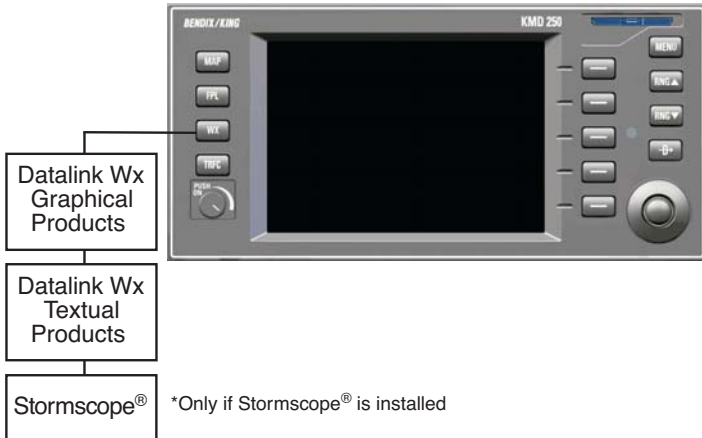
In the graphical weather products, each option can be selected in one of two ways. The first is using the menu as shown in the following steps:

1.   Press the **MENU** Key to display Figure 2-22.

2.   Press the **CHOOSE PRODUCT** Softkey to display Figure 2-23 (Figure 2-24 for XM).

MENU

3.   Using the Rotary Knob or Joystick, scroll to the desired product and press the **SELECT** Softkey.

This method allows for easily moving between graphical and textual weather products. It also makes it easy to quickly identify any weather products that have not been received by the KMD 250. These will appear "grayed out" and will not be selectable.
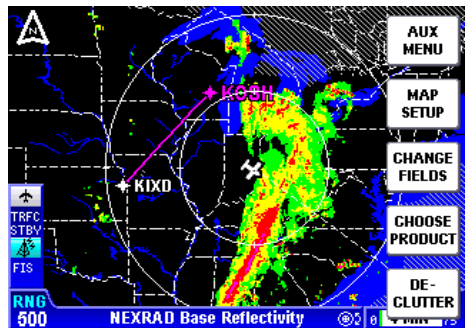
Figure 2-22

The second method of selecting options can be used for cycling through only the graphical products. If presently viewing a graphic product display, simply turn the Rotary Knob. Each click will select the next graphic display.

NOTE: The KMD 250 will only allow for selection and display of products for which data has been received. If a desired product is not available, it may be that the data has not yet been received or to which there is no subscription. Wx Watches and PIREPs are not available for XM WX and will not be listed
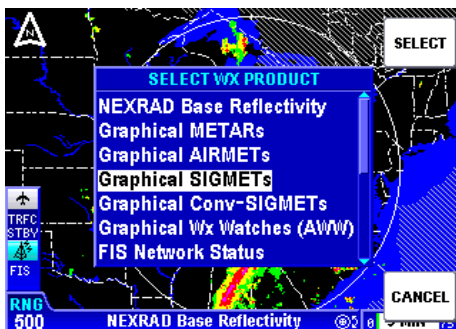
Figure 2-23
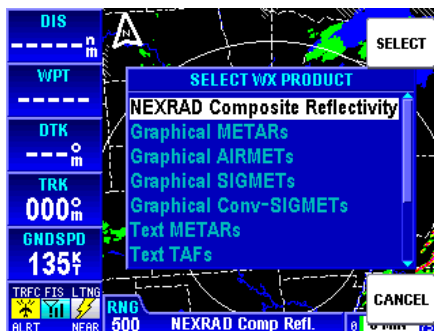
Figure 2-24

NEXRAD PAGE

The following illustration describes the NEXRAD VDL display. The NEXRAD XM display is the same except the FIS Icon is different and Composite Reflectivity is shown instead of Base Reflectivity.
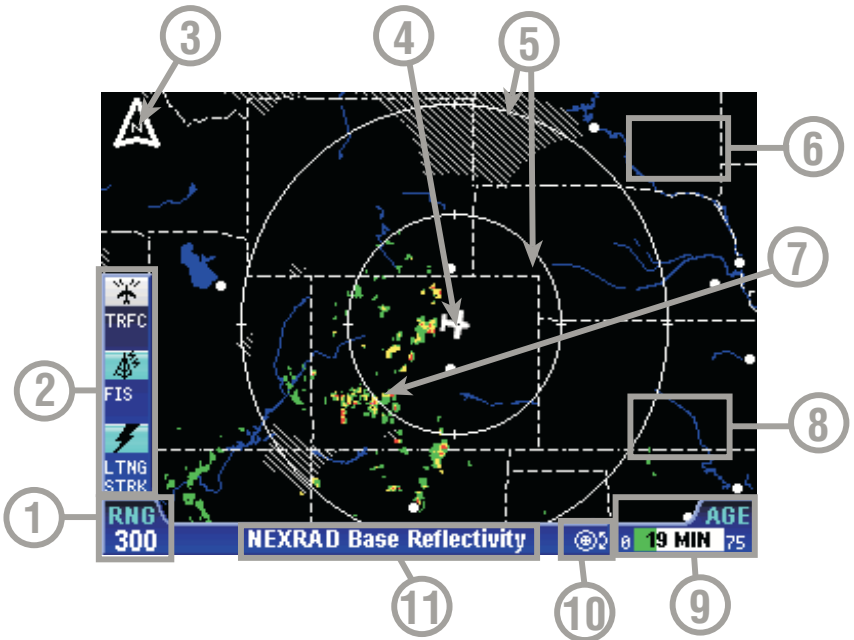
1 **Display Range** - **RNG:####**.
2 **Function Status Icons** - Displays icons representing data available and displayed.
3 **North Pointer**
4 **Aircraft Symbol** - Indicates present position. Stylized airplane when heading/track input is present, a plus symbol with no heading/track.
5 **Range Rings** - Outer ring radius is selected range, inner ring radius is one half the selected range.
6 **RESET STICK Soft Label** - Displayed when the Joystick is moved.
7 **Precipitation** - NEXRAD precipitation returns.
8 **LEGEND Soft Label** - Displayed when the Joystick is moved.
9 **Age of Data and Status Bar** - The age of the data is displayed in minutes based on current time minus the NEXRAD issue time. The colored bar indicates percentage of age versus elapsed time before expiration. The bar will be green the first 50% then turn yellow. Also, note in this example that the maximum age allowed for the display of this data is 75 minutes.
10 **Rotary Knob Active** - When displayed on the graphical weather products pages, rotating the knob will cycle through the products.
11 **Current Selection** - Displays the name of the weather product currently being viewed.

NEXRAD PAGE OPERATIONAL CONTROLS

CAUTION: NEXRAD data must only be used for strategic planning purposes. Due to inherent delays and relative age of the data that can be experienced, NEXRAD data cannot be used for tactical avoidance of weather.

WX Function Select Key - Cycles through Graphical Weather Products, Textual Weather Products and Stormscope®.

Rotary Knob - Turning the Rotary Knob cycles through the graphical NEXRAD, METAR, AIRMET, SIGMET, Convective SIGMET, Alert Weather Watches and FIS Network Status Pages.

Joystick - Moving the Joystick allows panning of the map and placement of the pointer over the desired weather activity to be viewed.

RNG▲/RNG▼ - Displays **ZOOMING TO ### nm** and advances the indicator to the next range. The upper button increases range, the lower button decreases it. The selected range is displayed in the lower left corner of the display with the outer range ring the displayed range and the inner range ring is half the displayed range.

USING THE NEXRAD PAGE

1. Press the **WX** Function Select Key until the FIS Graphics Page is displayed. If necessary, turn the Rotary Knob to obtain the NEXRAD Base Reflectivity display as shown in Figure 2-25. **NEXRAD Base Reflectivity** (**NEXRAD Composite Reflectivity** for XM) will be displayed at the bottom of the display.
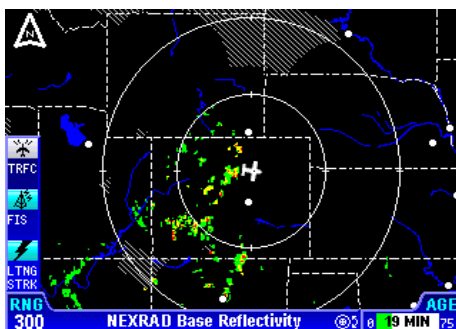
Figure 2-25

NOTE: If a notification such as that shown in Figure 2-26 is displayed, it may be that the system has not had time to acquire a signal or has acquired a signal and not yet received all the data for a NEXRAD image. If this notification is still present after more than 5-10 minutes, while in an area of expected coverage, refer to the FIS NOTIFICATIONS in this section.

Always make note of the age of the data displayed in the bottom right corner (see Figure 2-25). Remember, the older the age the more suspect the accuracy of the data. The colored bar will be green the first 50% of the expiration time period for the displayed data then turn yellow. Also, delays occurring prior to the weather distributor time stamping the data are not reflected in the displayed age. These delays can range from one to seven minutes.

Figure 2-26

If no data update has been received for 75 minutes the NEXRAD image is discarded and no longer displayed.

2. Press the **RNG▲/RNG▼** Key to zoom in or out on the display. The map is centered on the present position indicated by the symbolic aircraft.

Figure 2-27

3. To view a specific area of weather, move the joystick in the desired direction. A pointer will appear on the display (see Figure 2-27). The distance and bearing between present position and the pointer is shown at the bottom of the display. As the joystick is held the pointer will continue to move. When the pointer reaches the edge of

Figure 2-28

the display the map will pan to keep up with pointer movement. Release the joystick to stop moving the pointer. Press the **RNG▲/RNG▼** keys to zoom in or out on the pointer position.
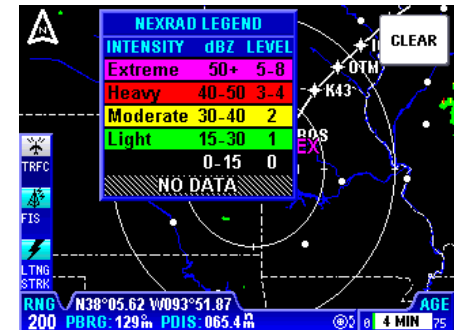
Pressing the **LEGEND** Softkey will display the VDL **NEXRAD LEGEND** as in Figure 2-28 (or the XM **NEXRAD LEGEND** as in Figure 2-29). Press the **CLEAR** Softkey to clear the legend from the display.

Figure 2-29

Press the **RESET STICK** Softkey to return to the present position display. If no actions are taken for a period of 30 seconds, the display will return to the present position.

GRAPHICAL METARS PAGE

The following illustration describes the Graphical METARs display. The only difference between VDL and XM is the FIS function status icon.
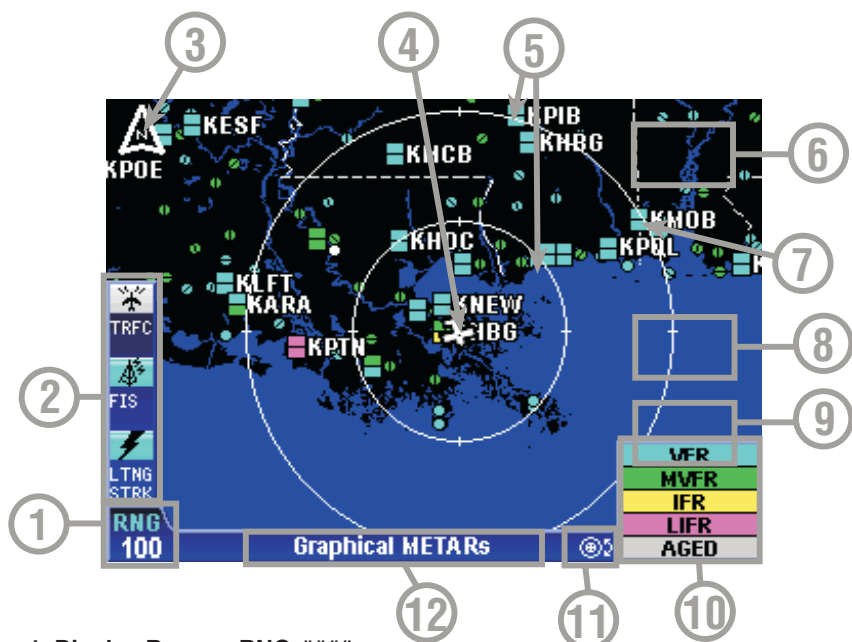
1 **Display Range** - **RNG:####**.
2 **Function Status Icons** - Displays icons representing data available and displayed.
3 **North Pointer**
4 **Aircraft Symbol** - Indicates present position. Stylized airplane when heading/track input is present, a plus symbol with no heading/track.
5 **Range Rings** - Outer ring radius is selected range, inner ring radius is one half the selected range.
6 **RESET STICK Soft Label** - Displayed when the Joystick is moved.
7 **Graphical METAR Icon** - Ceiling indicated in top box, visibiliy in bottom box and ICAO identifier of issuing airport. Note that ICAO identifiers are not displayed on all range settings.
8 **MORE INFO Soft Label** - Displayed when the Joystick Pointer is positioned over a METAR Icon. Pressing this Softkey will display more information.
9 **LEGEND Soft Label** - Displayed when the Joystick is moved.
10 **METAR Color Key** - Colors indicating flight rules pertaining to ceiling and visibility.
11 **Rotary Knob Active** - When displayed on the graphical weather products pages, rotating the knob will cycle through the products.
12 **Current Selection** - Displays the name of the weather product currently being viewed.

GRAPHICAL METARS PAGE OPERATIONAL CONTROLS

WX Function Select Key - Cycles through Graphical Weather Products, Textual Weather Products and Stormscope®.

Rotary Knob - Turning the Rotary Knob cycles through the graphical NEXRAD, METAR, AIRMET, SIGMET, Convective SIGMET, Alert Weather Watches and FIS Network Status Pages.

Joystick - Moving the Joystick allows panning of the map and placement of the pointer over the desired weather activity to be viewed.

RNG▲/RNG▼ - Displays **ZOOMING TO ### nm** and advances the indicator to the next range. The upper button increases range, the lower button decreases it. The selected range is displayed in the lower left corner of the display with the outer range ring the displayed range and the inner range ring is half the displayed range.

USING THE GRAPHICAL METARS PAGE

1. Press the **WX** Function Select Key until the FIS Graphics Page is displayed. If necessary, turn the Rotary Knob to obtain the Graphical METAR display similar to Figure 2-30. **Graphical METARs** will be displayed at the bottom of the display.

NOTE: This page will not be accessible until a valid FIS signal has been acquired and processed by the system.

Figure 2-30

2. Press the **RNG▲/RNG▼** Key to zoom in on the display. The map is centered on the present position indicated by the symbolic aircraft.

3. To view a specific METAR, move the joystick in the desired direction. A pointer will appear on the display. The distance and bearing between present position and the pointer is shown at the bottom center of the display (see Figure 2-31). As the joystick is held the pointer will continue to move. When the pointer reaches the edge of the display the map will pan to keep up with pointer movement. Release the joystick to stop moving the pointer. When the pointer moves over a graphical METAR icon, a box will pop up containing the **IDENT**, **NAME** and **CITY/STATE**

pertaining to the location and the **AGE** of the report (see Figure 2-32).

4. Press the **RNG▲/RNG▼** keys to zoom in or out on the pointer position.

5. Press the **MORE INFO** Softkey to display the Text METAR Page for the displayed location as in Figure 2-33.

6. Press the **RETURN TO MAP** Softkey to return to the previous display.

7. Press the **RESET STICK** Softkey to return to the present position display. If no actions are taken for a period of 30 seconds, the display will return to the aircraft present position display.

8. To view the **GRAPHICAL METAR LEGEND**, move the joystick pointer to an area with no icons and press the **LEGEND** Softkey. The legend will be displayed as in Figure 2-34. Press the **CLEAR** Softkey to remove the legend from the display.

Figure 2-31

Figure 2-32

Figure 2-33
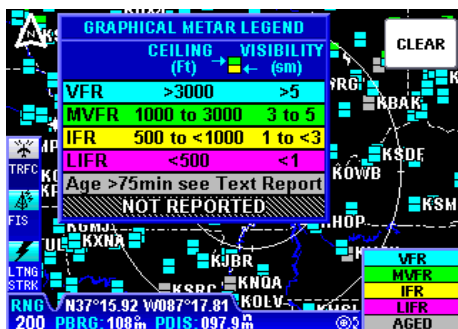
Figure 2-34

GRAPHICAL AIRMETS PAGE

The following illustration describes the Graphical AIRMETs display. The only difference between VDL and XM is the FIS function status icon.
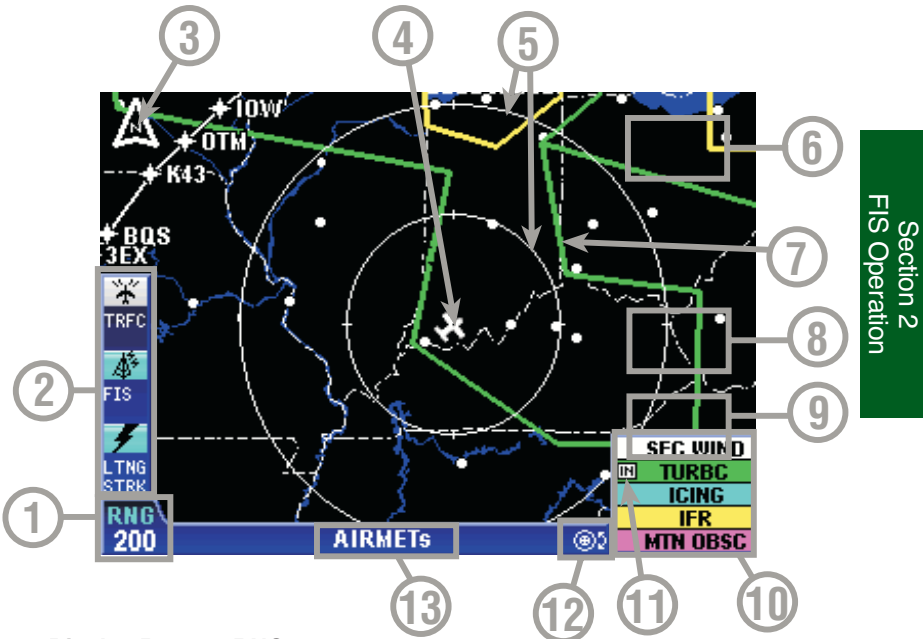
1. **Display Range** - **RNG:####**.
2. **Function Status Icons** - Displays icons representing data available and displayed.
3. **North Pointer**
4. **Aircraft Symbol** - Indicates present position. Stylized airplane when heading/track input is present, a plus symbol with no heading/track.
5. **Range Rings** - Outer ring radius is selected range, inner ring radius is one half the selected range.
6. **RESET STICK Soft Label** - Displayed when the Joystick is moved.
7. **AIRMET Boundary** - Color coded line indicating the boundaries of an AIRMET.
8. **MORE INFO Soft Label** - Displayed when the Joystick Pointer is positioned over an AIRMET boundary line. Pressing this Softkey will display more information.
9. **LEGEND Soft Label** - Displayed when the Joystick is moved.
10. **Boundary Color Key** - Colors indicate the type of weather phenomenon.
11. **IN** - Indicates the current aircraft position is "IN" a turbulence AIRMET.
12. **Rotary Knob Active** - When displayed on the graphical weather products pages, rotating the knob will cycle through the products.
13. **Current Selection** - Displays the name of the weather product currently being viewed.

GRAPHICAL AIRMETS PAGE OPERATIONAL CONTROLS

WX Function Select Key - Cycles through Graphical Weather Products, Textual Weather Products and Stormscope®.

Rotary Knob - Turning the Rotary Knob cycles through the graphical NEXRAD, METAR, AIRMET, SIGMET, Convective SIGMET, Alert Weather Watches and FIS Network Status Pages.

Joystick - Moving the Joystick allows panning of the map and placement of the pointer over the desired weather activity to be viewed.

RNG▲/RNG▼ - Displays **ZOOMING TO ### nm** and advances the indicator to the next range. The upper button increases range, the lower button decreases it. The selected range is displayed in the lower left corner of the display with the outer range ring the displayed range and the inner range ring is half the displayed range.

USING THE GRAPHICAL AIRMETS PAGE

1. Press the **WX** Function Select Key until the FIS Graphics Page is displayed. If necessary, turn the Rotary Knob to obtain the Graphical AIRMETs display similar to Figure 2-35. **AIRMETs** will be displayed at the bottom of the display.

NOTE: This page will not be accessible until a valid FIS signal has been acquired and processed by the system.

Figure 2-35

2. Press the **RNG▲/RNG▼** Key to zoom in on the display. The map is centered on the present position indicated by the symbolic aircraft.

3. To view a specific AIRMET, move the joystick in the desired direction and place the pointer on the desired AIRMET border (see Figure 2-36). A box will pop up containing the AIRMET designator, **TYPE** and the **AGE** of the report.

4. Press the **RNG▲/RNG▼** keys to zoom in or out on the pointer position.

5. Press the **MORE INFO** Softkey to display the Text AIRMET Page for the displayed location as in Figure 2-37.

6. Press the **RETURN TO MAP** Softkey to return to the previous display.

7. Press the **RESET STICK** Softkey to return to the present position display. If no actions are taken for a period of 30 seconds, the display will return to the aircraft present position display.

8. To view the **AIRMET LEGEND**, move the joystick to display the **LEGEND** Softkey. Press the **LEGEND** Softkey and the legend will be displayed as in Figure 2-38. Press the **CLEAR** Softkey to remove the legend from the display.
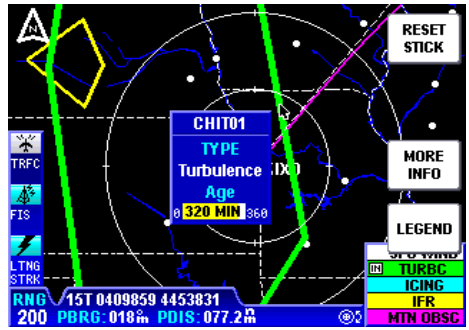
Figure 2-36
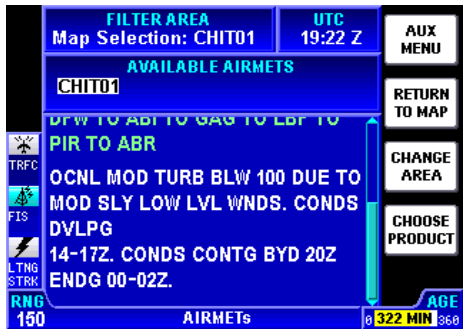
Figure 2-37
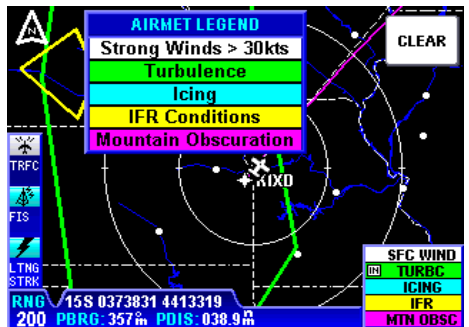
Figure 2-38

GRAPHICAL SIGMETS PAGE

The following illustration describes the Graphical SIGMETs display. The only difference between VDL and XM is the FIS function status icon.
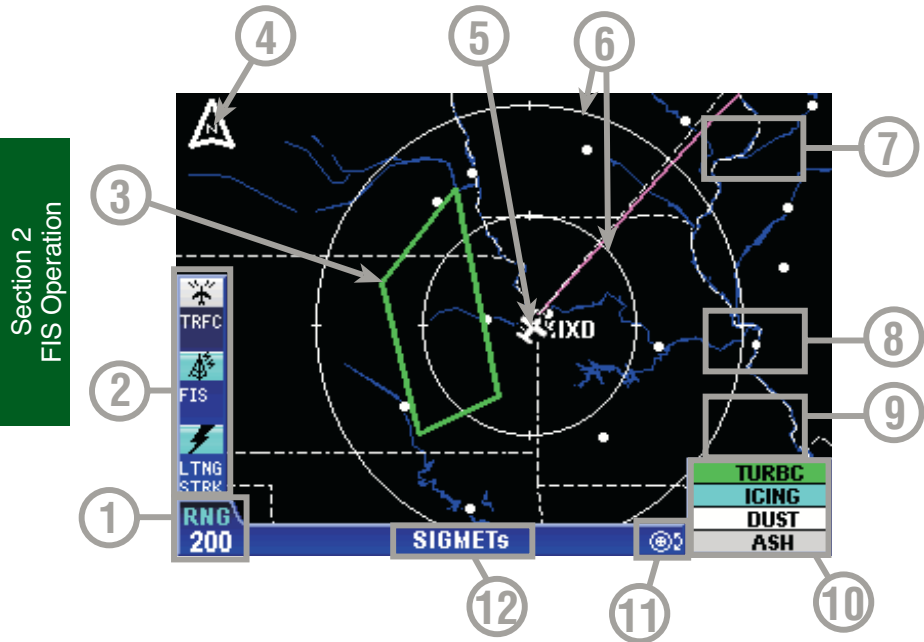
1 **Display Range** - **RNG:####**.
2 **Function Status Icons** - Displays icons representing data available and displayed.
3 **SIGMET Boundary** - Color coded line indicating the boundaries of a SIGMET.
4 **North Pointer**
5 **Aircraft Symbol** - Indicates present position. Stylized airplane when heading/track input is present, a plus symbol with no heading/track.
6 **Range Rings** - Outer ring radius is selected range, inner ring radius is one half the selected range.
7 **RESET STICK Soft Label** - Displayed when the Joystick is moved.
8 **MORE INFO Soft Label** - Displayed when the Joystick Pointer is positioned over a SIGMET boundary line. Pressing this Softkey will display more information.
9 **LEGEND Soft Label** - Displayed when the Joystick is moved.
10 **Boundary Color Key** - Colors indicate the type of weather phenomenon.
11 **Rotary Knob Active** - When displayed on the graphical weather products pages, rotating the knob will cycle through the products.
12 **Current Selection** - Displays the name of the weather product currently being viewed.

GRAPHICAL SIGMETS PAGE OPERATIONAL CONTROLS

WX Function Select Key - Cycles through Graphical Weather Products, Textual Weather Products and Stormscope®.

Rotary Knob - Turning the Rotary Knob cycles through the graphical NEXRAD, METAR, AIRMET, SIGMET, Convective SIGMET, Alert Weather Watches and FIS Network Status Pages.

Joystick - Moving the Joystick allows panning of the map and placement of the pointer over the desired weather activity to be viewed.

RNG▲/RNG▼ - Displays **ZOOMING TO ### nm** and advances the indicator to the next range. The upper button increases range, the lower button decreases it. The selected range is displayed in the lower left corner of the display with the outer range ring the displayed range and the inner range ring is half the displayed range.

USING THE GRAPHICAL SIGMETS PAGE

1. Press the **WX** Function Select Key until the FIS Graphics Page is displayed. If necessary, turn the Rotary Knob to obtain the Graphical SIGMETs display similar to Figure 2-39. **SIGMETs** will be displayed at the bottom of the display.

NOTE: This page will not be accessible until a valid FIS signal has been acquired and processed by the system.
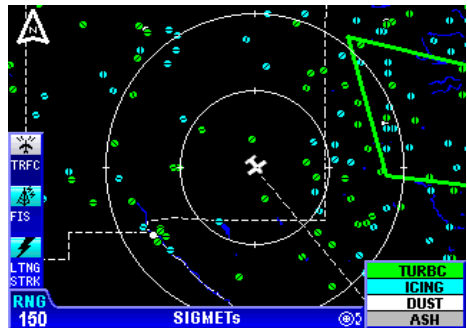
Figure 2-39

2. Press the **RNG▲/RNG▼** Key to zoom in on the display. The map is centered on the present position indicated by the symbolic aircraft.

3. To view a specific SIGMET, move the joystick in the desired direction and place the pointer on the desired SIGMET border (see Figure 2-40). A box will pop up containing the SIGMET designator, **TYPE** and the **AGE** of the report.

4. Press the **RNG▲/RNG▼** keys to zoom in or out on the pointer position.

5. Press the **MORE INFO** Softkey to display the Text SIGMET Page for the displayed location as in Figure 2-41.

6. Press the **RETURN TO MAP** Softkey to return to the previous display.

7. Press the **RESET STICK** Softkey to return to the present position display. If no actions are taken for a period of 30 seconds, the display will return to the aircraft present position display.

8. To view the **SIGMET LEGEND**, move the joystick to display the **LEGEND** Softkey. Press the **LEGEND** Softkey and the legend will be displayed as in Figure 2-42. Press the **CLEAR** Softkey to remove the legend from the display.
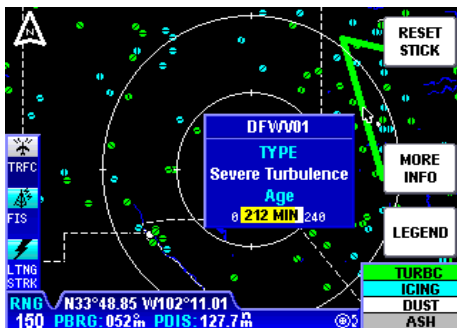
Figure 2-40

Figure 2-41
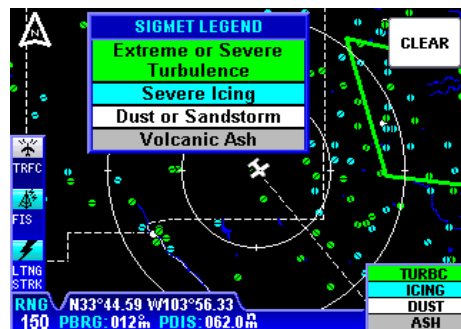
Figure 2-42

GRAPHICAL CONVECTIVE SIGMETS PAGE

The following illustration describes the Graphical Convective SIGMETs display. The only difference between VDL and XM is the FIS function status icon.
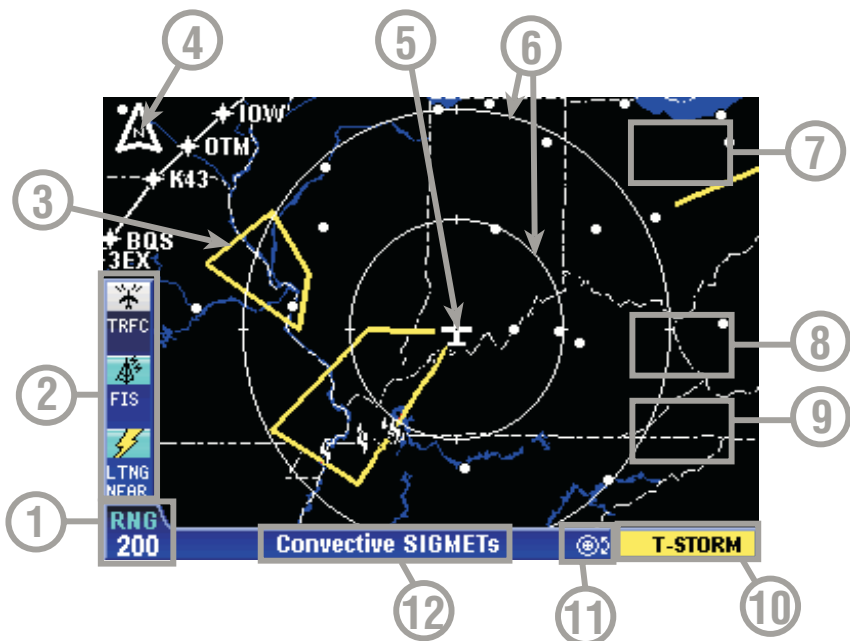
1 **Display Range** - **RNG:####**.
2 **Function Status Icons** - Displays icons representing data available and displayed.
3 **Convective SIGMET Boundary** - Yellow line indicates the boundaries of a Convective SIGMET.
4 **North Pointer**
5 **Aircraft Symbol** - Indicates present position. Stylized airplane when heading/track input is present, a plus symbol with no heading/track.
6 **Range Rings** - Outer ring radius is selected range, inner ring radius is one half the selected range.
7 **RESET STICK Soft Label** - Displayed when the Joystick is moved.
8 **MORE INFO Soft Label** - Displayed when the Joystick Pointer is positioned over a boundary line. Pressing this Softkey will display more information.
9 **LEGEND Soft Label** - Displayed when the Joystick is moved.
10 **Boundary Color Key** - Colors indicating type of weather phenomenon.
11 **Rotary Knob Active** - When displayed on the graphical weather products pages, rotating the knob will cycle through the products.
12 **Current Selection** - Displays the name of the weather product currently being viewed.

GRAPHICAL CONVECTIVE SIGMETS PAGE OPERATIONAL CONTROLS

WX Function Select Key - Cycles through Stormscope®, Graphical Weather Products and Textual Weather Products.

Rotary Knob - Turning the Rotary Knob cycles through the graphical NEXRAD, METAR, AIRMET, SIGMET, Convective SIGMET, Alert Weather Watches and FIS Network Status Pages.

Joystick - Moving the Joystick allows panning of the map and placement of the pointer over the desired weather activity to be viewed.

RNG▲/RNG▼ - Displays **ZOOMING TO ### nm** and advances the indicator to the next range. The upper button increases range, the lower button decreases it. The selected range is displayed in the lower left corner of the display with the outer range ring the displayed range and the inner range ring is half the displayed range.

USING THE GRAPHICAL CONVECTIVE SIGMETS PAGE

1. Press the **WX** Function Select Key until the FIS Graphics Page is displayed. If necessary, turn the Rotary Knob to obtain the Graphical Convective SIGMETs display similar to Figure 2-43. **Convective SIGMETs** will be displayed at the bottom of the display.
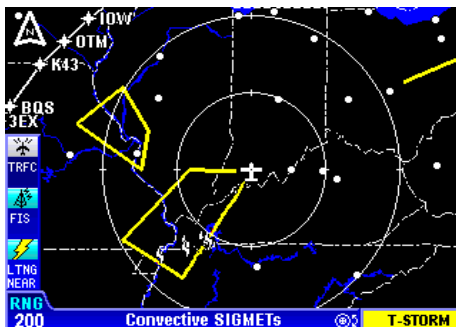
NOTE: This page will not be accessible until a valid FIS signal has been acquired and processed by the system.

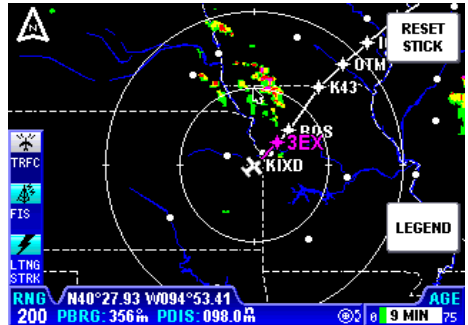**Figure 2-43**

2. Press the **RNG▲/RNG▼** Key to zoom in on the display. The map is centered on the present position indicated by the symbolic aircraft.

3. To view a specific Convective SIGMET, move the joystick in the desired direction and place the pointer on the desired Convective SIGMET border (see Figure 2-44). A box will pop up containing the Convective SIGMET designator, **TYPE** and the **AGE** of the report.

4. Press the **RNG▲/RNG▼** keys to zoom in or out on the pointer position.

5. Press the **MORE INFO** Softkey to display the Text Convective SIGMET Page for the displayed location as in Figure 2-45.

6. Press the **RETURN TO MAP** Softkey to return to the previous display.

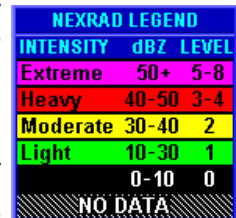*Figure 2-44*

7. Press the **RESET STICK** Softkey to return to the present position display. If no actions are taken for a period of 30 seconds, the display will return to the aircraft present position display.

8. To view the **CONV SIGMET LEGEND**, move the joystick to display the **LEGEND** Softkey. Press the **LEGEND** Softkey and the legend will be displayed as in Figure 2-46. Press the **CLEAR** Softkey to remove the legend from the display.
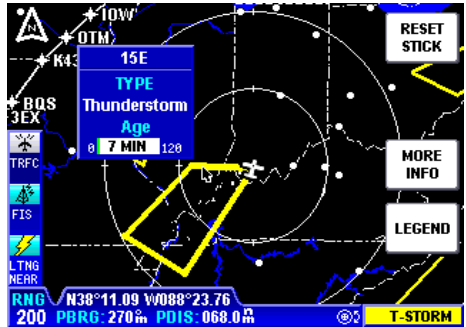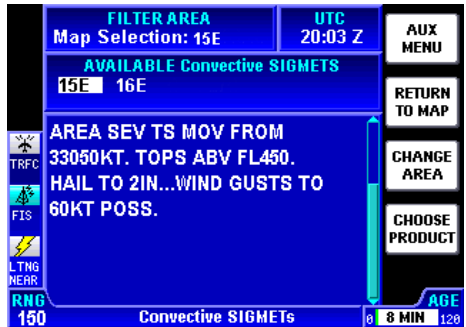
Figure 2-45

Figure 2-46

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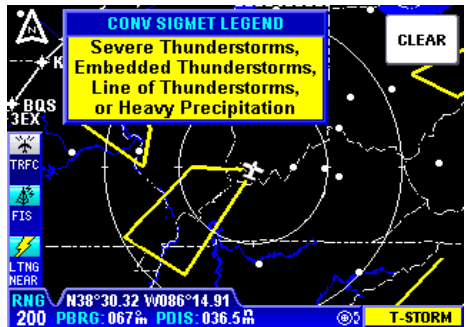
GRAPHICAL ALERT WEATHER WATCHES PAGE (AWW) (VDL ONLY)

The following illustration describes the Graphical Alert Weather Watches (AWW) display.
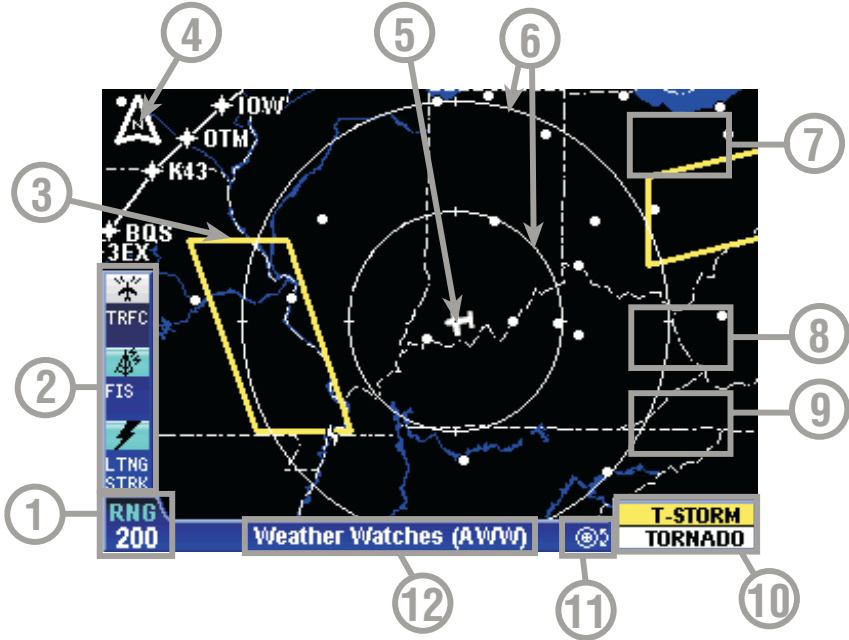
1 **Display Range** - **RNG:####**.
2 **Function Status Icons** - Displays icons representing data available and displayed.
3 **Weather Watch Boundary** - Color coded line indicates the boundaries and type of Weather Watch.
4 **North Pointer**
5 **Aircraft Symbol** - Indicates present position. Stylized airplane when heading/track input is present, a plus symbol with no heading/track.
6 **Range Rings** - Outer ring radius is selected range, inner ring radius is one half the selected range.
7 **RESET STICK Soft Label** - Displayed when the Joystick is moved.
8 **MORE INFO Soft Label** - Displayed when the Joystick Pointer is positioned over a boundary line. Pressing this Softkey will display more information.
9 **LEGEND Soft Label** - Displayed when the Joystick is moved.
10 **Boundary Color Key** - Colors indicating type of weather phenomenon.
11 **Rotary Knob Active** - When displayed on the graphical weather products pages, rotating the knob will cycle through the products.
12 **Current Selection** - Displays the name of the weather product currently being viewed.

GRAPHICAL WEATHER WATCHES PAGE OPERATIONAL CONTROLS

 WX Function Select Key - Cycles through Graphical Weather Products, Textual Weather Products and Stormscope®.

 Rotary Knob - Turning the Rotary Knob cycles through the graphical NEXRAD, METAR, AIRMET, SIGMET, Convective SIGMET, Alert Weather Watches and FIS Network Status Pages.

Joystick - Moving the Joystick allows panning of the map and placement of the pointer over the desired weather activity to be viewed.

 RNG▲/RNG▼ - Displays **ZOOMING TO ### nm** and advances the indicator to the next range. The upper button increases range, the lower button decreases it. The selected range is displayed in the lower left corner of the display with the outer range ring the displayed range and the inner range ring is half the displayed range.

USING THE GRAPHICAL WEATHER WATCHES PAGE

1. Press the **WX** Function Select Key until the FIS Graphics Page is displayed. If necessary, turn the Rotary Knob to obtain the Graphical Weather Watches display similar to Figure 2-47. **Weather Watches (AWW)** will be displayed at the bottom of the display.

NOTE: This page will not be accessible until a valid FIS signal has been acquired and processed by the system.
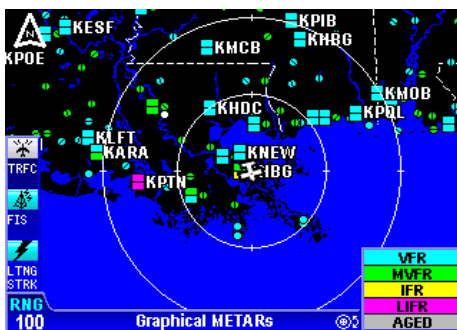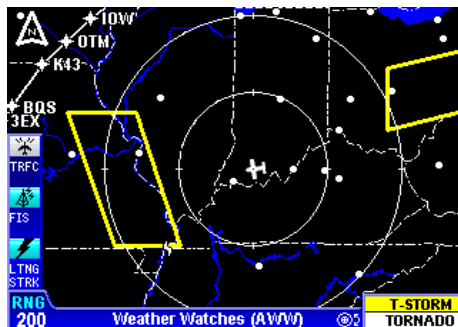

Figure 2-47

2. Press the **RNG▲/RNG▼** Key to zoom in on the display. The map is centered on the present position indicated by the symbolic aircraft.

3. To view a specific Weather Watch, move the joystick in the desired direction and place the pointer on the desired Weather Watch border (see Figure 2-48). A box will pop up containing the Weather Watch designator, **TYPE** and the **AGE** of the report.

4. Press the **RNG▲/RNG▼** keys to zoom in or out on the pointer position.

5. Press the **MORE INFO** Softkey to display the Text Weather Watch Page for the displayed location as in Figure 2-49.

Figure 2-48

6. Press the **RETURN TO MAP** Softkey to return to the previous display.

7. Press the **RESET STICK** Softkey to return to the present position display. If no actions are taken for a period of 30 seconds, the display will return to the aircraft present position display.

Figure 2-49

8. To view the **Wx WATCH (AWW) LEGEND**, move the joystick to display the **LEGEND** Softkey. Press the **LEGEND** Softkey and the legend will be displayed as in Figure 2-50. Press the **CLEAR** Softkey to remove the legend from the display.
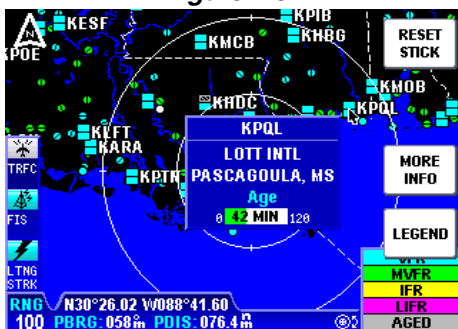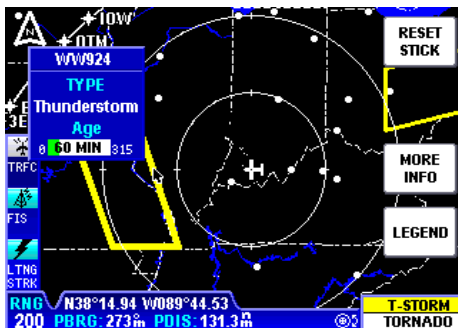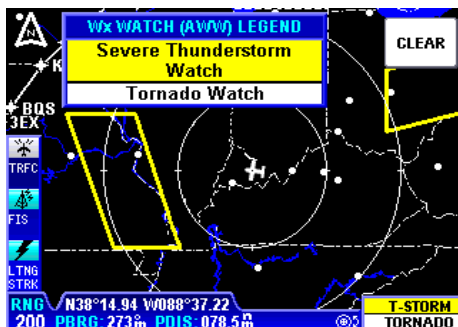

Figure 2-50

# FIS NETWORK STATUS PAGE (VDL ONLY)

The FIS Network Status Page displays the location and identifier of installed ground stations. This page can also be used to determine which stations are being received and the status of each station.

The following illustration describes the FIS Network Status Page display.
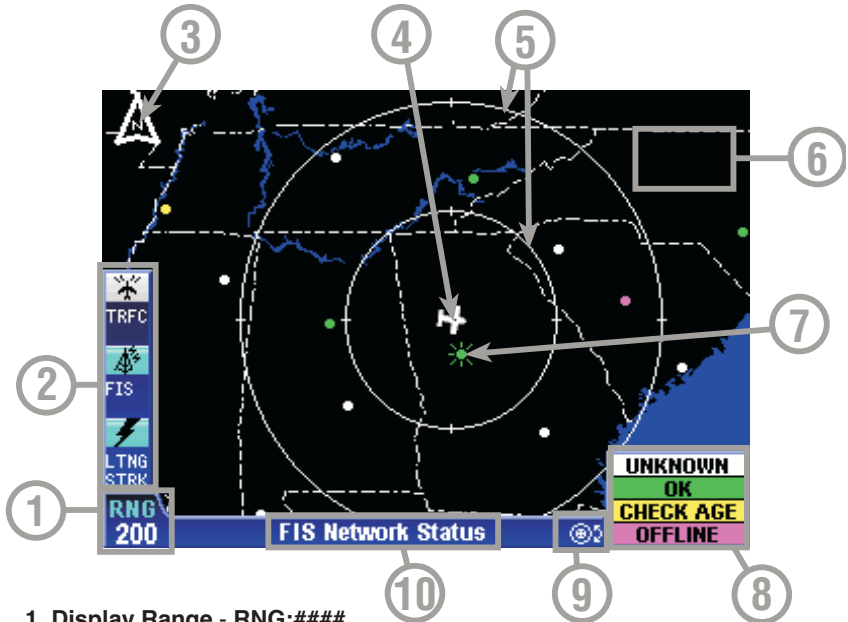
1 **Display Range** - **RNG:####**.
2 **Function Status Icons** - Displays icons representing data available and displayed.
3 **North Pointer**
4 **Aircraft Symbol** - Indicates present position. Stylized airplane when heading/track input is present, a plus symbol with no heading/track.
5 **Range Rings** - Outer ring radius is selected range, inner ring radius is one half the selected range.
6 **RESET STICK Soft Label** - Displayed when the Joystick is moved.
7 **FIS Station Icon** - Color coded icon indicates station location and status. The "starburst" indicates station currently being received.
8 **Color Key** - Ground station status legend.
   UNKNOWN indicates the station status is unknown. If network status information has not been recently received, all sites will be shown as **UNKNOWN** in white at their last known location.
   OK indicates the station is broadcasting current information.
   CHECK AGE indicates the station is operating, but may not be broadcasting the most recent information. Check the age of the data before using.
   OFFLINE indicates the station is known to be offline.
9 **Rotary Knob Active** - When displayed on the graphical weather products pages, rotating the knob will cycle through the products.
10 **Current Selection** - Displays the name of the weather product currently being viewed.

FIS NETWORK STATUS PAGE OPERATIONAL CONTROLS

WX Function Select Key - Cycles through Graphical Weather Products, Textual Weather Products and Stormscope®.

Rotary Knob - Turning the Rotary Knob cycles through the graphical NEXRAD, METAR, AIRMET, SIGMET, Convective SIGMET, Alert Weather Watches and FIS Network Status Pages.

Joystick - Moving the Joystick allows panning of the map and placement of the pointer over the desired weather activity to be viewed.

RNG▲/RNG▼ - Displays **ZOOMING TO ### nm** and advances the indicator to the next range. The upper button increases range, the lower button decreases it. The selected range is displayed in the lower left corner of the display with the outer range ring the displayed range and the inner range ring is half the displayed range.

USING THE FIS NETWORK STATUS PAGE

1. Press the **WX** Function Select Key until the FIS Graphics Page is displayed. If necessary, turn the Rotary Knob to obtain the FIS Network Status display similar to Figure 2-51. **FIS Network Status** will be displayed at the bottom of the display.
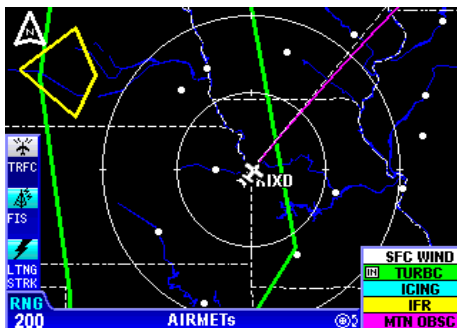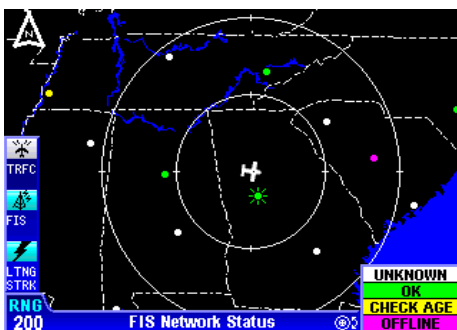

Figure 2-51

2. Press the **RNG▲/RNG▼** Key to zoom in on the display. The map is centered on the present position indicated by the symbolic aircraft.
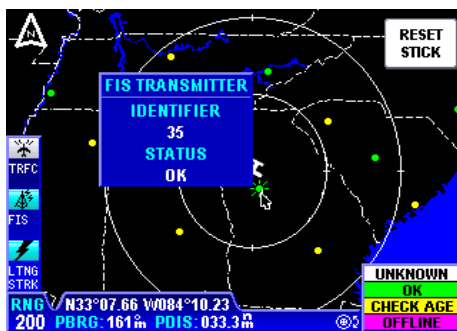
3. To view a specific FIS Network station move the joystick in the desired direction and place the pointer on the desired station icon (see Figure 2-52). A box will pop up

Figure 2-52

containing the **FIS TRANSMITTER IDENTIFIER** and **STATUS**.

4. Press the **RESET STICK** Softkey to return to the present position display. If no actions are taken for a period of 30 seconds, the display will return to the aircraft present position display.

NOTE: At any given moment the FIS receiver may not be receiving the closest transmitting site. This is not a problem since all stations transmit the same data.

Visit Wingman Services at www.bendixking.com to view the latest information about network transmitter locations and to cross-reference ground station IDs with the location names.

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FIS Operation

FIS TEXTUAL WEATHER PRODUCTS

The following illustration describes the FIS Textual Products display. The
only difference between VDL and XM is the FIS function status icon.
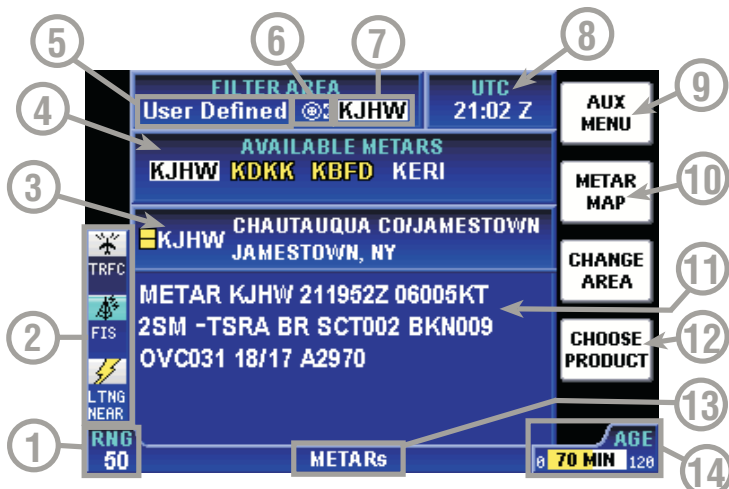
1. **Report Range** - **RNG:####**. Pressing the **RNG▲/RNG▼** Key will change the
   distance radius from the selected **FILTER AREA** in which available reports will
   be listed. In this case all available METARs with a 50 mile radius of **KJHW**
   will be listed in the **AVAILABLE METARS** field.
2. **Function Status Icons** - Displays icons representing data available (black)
   and displayed (color).
3. **Selected Report Info** - Displays identifier, name, city and state of selected
   report. This field is only displayed for METARs, TAFs and PIREPs when available.
4. **Available Reports** - Shows available reports based on the selection
   in the **FILTER AREA** field. Special, urgent or amended reports are
   highlighted in yellow. Horizontal movement of the joystick will move the
   cursor over the next report in the field. The presence of a scroll bar
   indicates more reports are available, but not displayed.
5. **Filter Area Selection** - Pressing the **CHANGE AREA** Softkey cycles
   between Destination, Flightplan WPT, Nearest and User Defined.
6. **Knob Active** - When displayed, the Rotary Knob can be used to select
   an identifier from the database or Flightplan. This is only available when
   User Defined or **FPL WPT** is selected.
7. **Selected Identifier** - Indicates the currently selected identifier.
8. **UTC** - Current UTC time.
9. **METAR MAP Softlabel** - In this case, when this key is pressed the graphical
   METAR page is displayed with the map centered on the selected METAR.
   This softkey corresponds to the currently selected textual product, i.e
   METAR MAP. This is only available when valid data is being received.
10. **Change Area Softlabel** - Cycles the **FILTER AREA** field between
    Destination, Flightplan Waypoint (FPL WPT), Nearest and User Defined.
11. **Text Field** - The encoded weather report is displayed in this field.
12. **CHOOSE PRODUCT Softlabel** - Pressing this softkey will display the
    SELECT WX PRODUCT window. Use the Rotary Knob or Joystick to
    highlight the desired product and press **SELECT**.
13. **Current Selected** - Indicates the currently selected weather product.
14. **Age of Report**- Age of report based on UTC time minus time of report.
    The colored bar indicates percentage of age versus elapsed time before
    expiration. The bar will be green the first 50% then turn yellow.

FIS TEXTUAL PRODUCTS OPERATIONAL CONTROLS

WX Function Select Key - Cycles through Graphical Weather Products, Textual Weather Products and Stormscope®.

MAP Softkey - Depending on which textual product is currently being viewed, this softkey will be labeled for corresponding graphical product page. For example, if viewing the textual METAR page this softkey will be labeled **METAR MAP** as shown here. If viewing the textual AIRMETs page this softkey will be labeled **AIRMET MAP** and so on.

NOTE: If no location description is provided in the textual AIRMET the AIRMET cannot be depicted graphically. These AIRMETs are denoted by displaying the AIRMET identifier in green within the textual AIRMET. Also, the AIRMET MAP Softkey will not be available.

CHANGE AREA Softkey - Pressing the **CHANGE AREA** softkey will cycle through the four options available for the **FILTER AREA** field in the upper part of the display. Available selections are **Destination**, **Nearest**, **FPL WPT** and **User Defined**. The closest available weather reports for the selected **FILTER AREA** will be displayed in the **AVAILABLE** reports field.

CHOOSE PRODUCT Softkey - Pressing the **CHOOSE PRODUCT** softkey will display the **SELECT WX PRODUCT** window. Use the Rotary Knob or Joystick to highlight the desired weather product.

Rotary Knob/Joystick - These may be used to highlight the desired weather product in the **SELECT WX PRODUCT** window. The Rotary Knob may also be used to scroll through flightplan waypoints and enter airport identifiers.

SELECT Softkey - After highlighting the desired weather product in the **SELECT WX PRODUCT** window, pressing the **SELECT** Softkey will display the chosen weather product.

RNG▲/RNG▼ Keys - The KMD 250 displays all textual weather product reports available within a specified radius of the selection made in the **FILTER AREA**. This specified radius can be changed by pressing the **RNG▲/RNG▼** Keys.

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FIS Operation

USING THE FIS TEXT PAGE

Press the **WX** Function Select Key until the FIS Textual Page is displayed as shown in Figure 2-53.

NOTE: If a notification such as that shown in Figure 2-54 is displayed, it may be that the system has not had time to acquire a signal. If this notification is still present after a few minutes, refer to the FIS NOTI-FICATIONS section of this section.

If no METAR is available in the selected area, a notification such as that shown in Figure 2-55 will be displayed.

The example displayed in Figure 2-53 is a METAR report for **KIXD**, which was selected as a **User Defined area**.

Press the **METAR MAP** Softkey to display the graphical METAR for the **KIXD** as shown in Figure 2-56. Press the **MORE INFO** Softkey to return the textual report.

The **METAR MAP** Softkey will change depending on the selected weather product. In this case a METAR is being viewed so the label displays **METAR MAP**. If viewing an AIRMET, the label would show **AIRMET MAP** and so on. In short, pressing this softkey will display the graphical weather product for the appropriate textual weather product selected.

NOTE: See Appendix B for a list of common weather abbreviations.

Figure 2-53
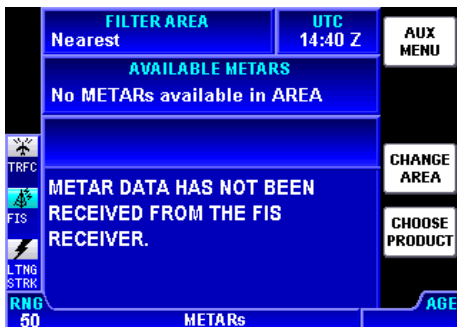
Figure 2-54

Figure 2-55

Figure 2-56

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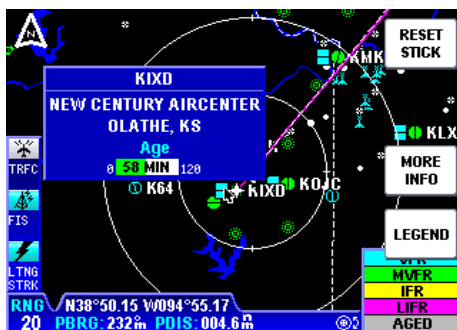
CHANGING WEATHER PRODUCTS

1. Press the **CHOOSE PRODUCT** Softkey to display the **SELECT WX PRODUCT** window as shown in Figure 2-57.

Figure 2-57

2. Turn the Rotary Knob or move the Joystick up or down to highlight the desired weather product.

3. Press the **SELECT** Softkey. If a Graphical Weather Product is selected, refer to that particular Graphical Weather Products section for operation.

4. If desired, press the **RNG▲/RNG▼** Keys to change the reporting radius for the selected **FILTER AREA**. The default distance for METARs is 50nm and TAFs is 100nm. All others are 150nm. The user selected distance can be from 50 to 300nm.

Figure 2-58

Note that in Figure 2-58, METARs have been selected with the default **RNG** of **50**nm. In this example all METAR reports within 50nm of the **User Defined** location of **KJHW** are listed in the **AVAILABLE METARS** field. The scroll bar indicates not all reports are dis-

Figure 2-59

played. Move the Joystick to the right to select the different reports.

In Figure 2-59 the **RNG▲** Key has been used to change the report **RNG** to **150**nm. Note that more reports are now in the **AVAILABLE METARS** field due to selecting the larger 150nm radius.

The **AVAILABLE METARS** field (or TAFS, PIREPS, etc.) lists closest first, furthest last. For instance, the display shown in Figure 2-53 lists all available METARs within 50nm of KJHW (the selected **FILTER AREA**).
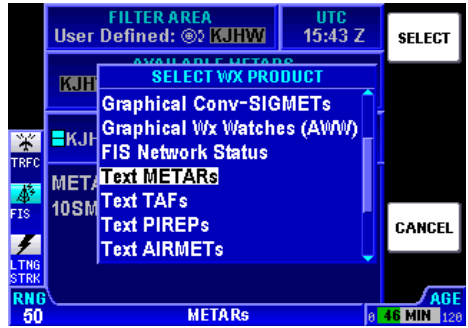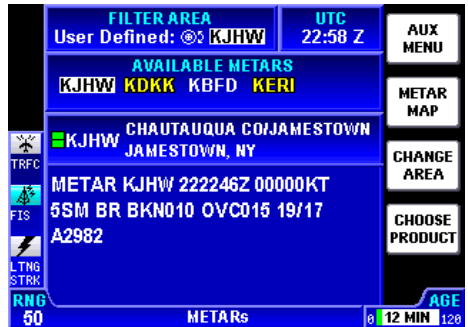
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KJHW is also a reporting station which is listed first in the **AVAILABLE METARS** field. Use the joystick to scroll through the **AVAILABLE METARS**. Urgent, special or amended reports will be highlighted in yellow.

Note that the displayed report in Figure 2-54 is 12 minutes old. The bar indicates a percentage of time left before expiration. The bar will be green the first 50%, then turn yellow.

CHANGING FILTER AREA

1. Press the **CHANGE AREA** Softkey to view either **Nearest** to present position, a **User Defined** location, the **Destination** (last waypoint in a flightplan) or **FPLN WPT** (any waypoint in an active flightplan). The softkey cycles through the **FILTER AREA**s as shown in Figure 2-60.
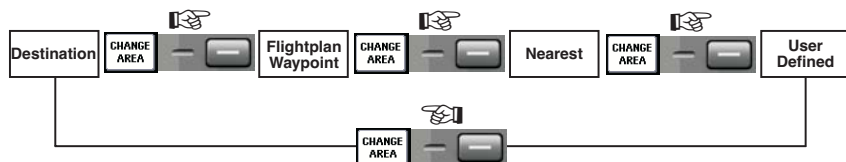
Figure 2-60

These four selectable areas are used to make it easier to find all the reports near a specific location without having to know the exact identifier of the reporting station.

Scanning Flightplan Waypoints

If **FPLN WPT** is selected in the **FILTER AREA** field (as shown in Figure 2-61), the Rotary Knob can be used to sequence through all the waypoints on the active flightplan. The next waypoint from the current position will be displayed.

Figure 2-61

Turn the Rotary Knob clockwise to sequence forward through the waypoints. Turn the Rotary Knob counter-clockwise to sequence backward through the waypoints.

Finding User Defined Areas by Identifier

If **User Defined** has been selected, as in Figure 2-62, use the following procedure to change the location.

1. Turn the Rotary Knob to display the **USER DEFINED AREA ENTRY** window as shown in Figure 2-63. The identifier previously selected is displayed with the appropriate name and city. Note the first character in the **IDENT** field is highlighted. Turn the Rotary Knob to change this character.

2. Move the Joystick to the right to highlight the next character as seen in Figure 2-64. Again, turn the Rotary Knob to change the character. Continue changing each character in this manner until the desired identifier is entered.

3. After entering the desired the identifier, press the **OK** Softkey. The selected weather product will now be displayed for the new **User Defined** area.

Finding User Defined Areas by Name or City

When the identifier of the desired location is known, the method previously described

Figure 2-62

Figure 2-63

Figure 2-64

can be used to select it. However, if the identifier is not known, the name of the location can be entered. The system will also allow entry of just the first few characters of the location name to help find it in the database. If neither the identifier nor the location name is known, the city/state can be scanned.

To Enter Location Name:

The following example shows entering **MONTROSE REGL** as a location.

1. Turn the Rotary Knob to display the **USER DEFINED AREA ENTRY** window as shown in Figure 2-63.

2. Move the Joystick down to highlight the first character of the location name as shown in Figure 2-65.

3. Turn the Rotary Knob counterclockwise until an **M** is selected as shown in Figure 2-66.

4. Move the Joystick to the right to highlight the next character as seen in Figure 2-67.

5. Turn Rotary Knob clockwise until an **O** is selected. Continue moving the cursor and entering characters until **MONTROSE** is displayed.

Figure 2-65

Figure 2-66

Figure 2-67

6. Press the **KNOB SCAN** Softkey and Figure 2-68 will be displayed.

7. Turn the Rotary Knob one click clockwise. The first occurance of names starting with Montrose in the database is now displayed as in Figure 2-69.

8. Turn the Rotary Knob to scan through the database until the desired name is displayed as in Figure 2-70.

9. Press the **OK** Softkey to view the selected weather product for **MONTROSE REGL**.

To Enter Location by City:

A location may be selected by first entering the city using the same method as entering the location name.

1. After entering the city, press the **KNOB SCAN** Softkey.

2. Turning the Rotary Knob will scan through the database displaying each entry for the city of Montrose.

3. Press the **OK** Softkey when the desired location is displayed.
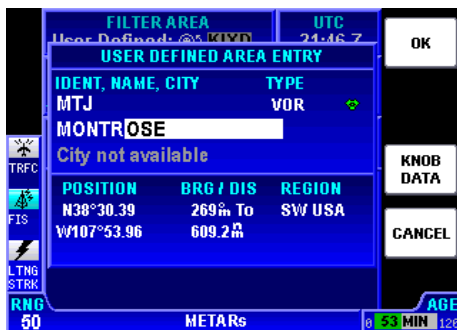
Figure 2-68
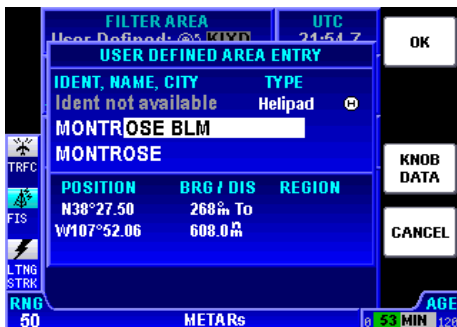
Figure 2-69
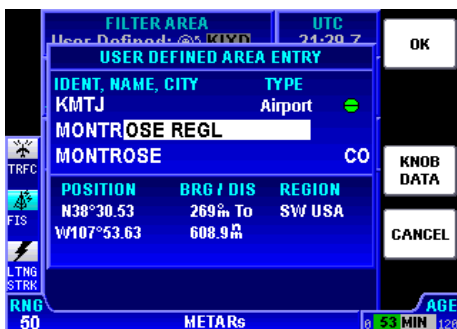
Figure 2-70

To Scan for Location Name:

Sometimes, only a portion of the airport name may come to mind. The following example shows scanning for **EAGLE GROVE MUN** when **EAGLE** is the only portion of the name remembered.

1. If necessary press the **CHANGE AREA** Softkey to select **User Defined** in the **FILTER AREA**.

2. Turn the Rotary Knob to display the **USER DEFINED AREA ENTRY** window as shown in Figure 2-71.

3. Move the Joystick down to highlight the first the character of the location name as shown in Figure 2-72.

4. Turn the Rotary Knob counterclockwise until an **E** is selected as shown in Figure 2-73.
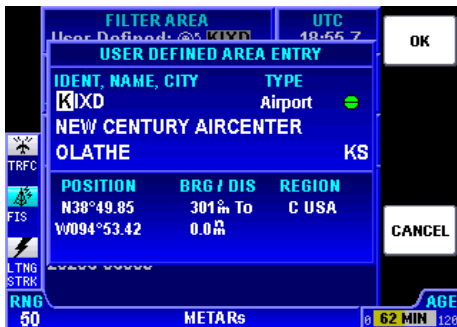
Figure 2-71

Figure 2-72

Figure 2-73

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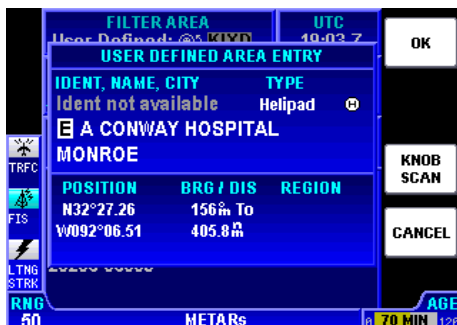
5. Move the Joystick to the right to highlight the next character space as seen in Figure 2-74.

6. Turn Rotary Knob clockwise until an **A** is selected as in Figure 2-75. Continue moving the cursor and entering characters until **EAGLE** is displayed.

7. Press the **KNOB SCAN** Softkey and Figure 2-76 will be displayed.

8. Turn the Rotary Knob to sequence through all the location names in the database beginning with **EAGLE**. stopping at the desired name as in Figure 2-77.

9. Press the **OK** Softkey to select **EAGLE GROVE MUN** as the **User Defined** area.

NOTE: This same method may be used with the name of the city where the airport is located.

This method is also used to choose the desired airport among those of identical names, but located in different cities.
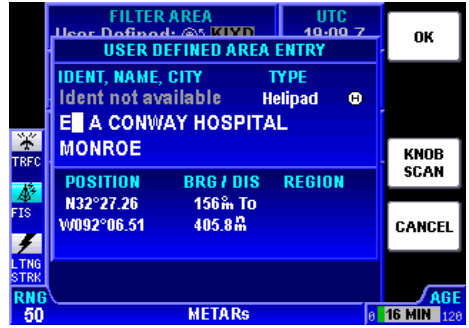
Figure 2-74
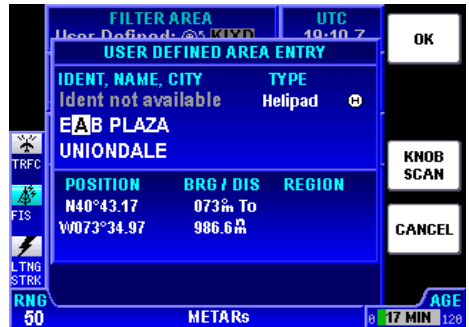
Figure 2-75

Figure 2-76

Figure 2-77

Intentionally left blank

FIS NOTIFICATIONS

The following are descriptions of FIS notifications that may be displayed.

(GRAPHICAL PRODUCT) DATA HAS NOT BEEN RECEIVED

If no valid graphical product data is received (in this case NEXRAD) a notification such as that shown in Figure 2-78 will be displayed.

This notification usually means that the system is not in FIS VDL coverage or there is no subscription set up for the Value Added Product selected. For XM WX, the notification usually means that the XM WX signal strength is poor.

Figure 2-78

The notification can also occur while in coverage if not all of the data for a weather product has been received.

NO METARS AVAILABLE IN SELECTED AREA

A notification such as that shown in Figure 2-79 will be displayed if no METARs are available in the selected area.

Figure 2-79

This notification means that the FIS system is working properly, there are simply no reports of the selected mode within the area.
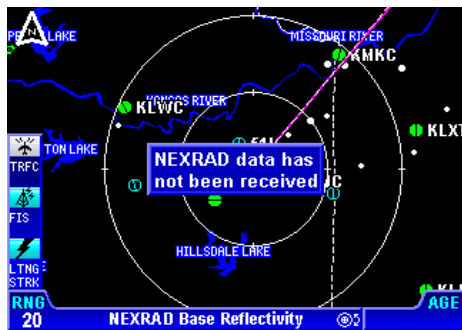
NO METARS AVAILABLE, DATA NOT RECEIVED

This notification will be displayed (Figure 2-80) if no METAR data has been received.

This notification means the FIS system has not received any METAR data. This may be due to not being in FIS coverage or to poor signal strength.
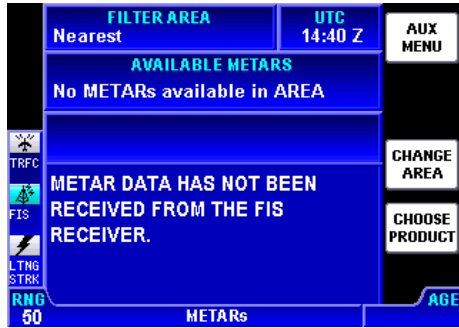
Figure 2-80

INVALID SUBSCRIPTION CODE. PLEASE CHECK AND RE-ENTER CODE (VDL ONLY)

This notification will be displayed (Figure 2-81) if an invalid Subscription Code is entered. This may be due to an error entering the Subscription Code. Also, it may be due to a Subscription Code being entered that is associated with a different Display ID.

Figure 2-81

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UNDERSTANDING TEXTUAL AVIATION WEATHER REPORTS

UNDERSTANDING METARS

Refer to the numbers on the following diagram to find the appropriate descriptions.

```
  1      2      3       4        5             6             7      8

METAR KPIT 201955Z AUTO 22015G25KT 3/4SM R28R/2600FT TSRA OVC010CB
18/16 A2992 RMK SLPO13 T01760158 PK WND 22030/15

  9   10                    11
```
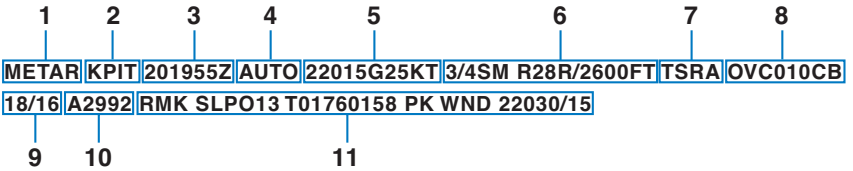
1. Type of Report: **METAR** (SPECI will be seen here if this is a Special Weather Report)

2. ICAO Station Identifier: **KPIT**

This is the location for which the METAR pertains.

3. Date and Time of Issue: **201955Z**

The **20**th day of the month at **1955Z**ulu or UTC.

4. **AUTO** indicates the reporting station is an automated station. If the reporting station is a manned station this element will be omitted. Also, if a report from an automated station is modified by a person this element will be omitted. "COR" indicates a corrected report.

5. Wind: **22015G25KT**

220 is the 3 digit true direction to the nearest 10°. Airport advisory service, ATIS and ATC towers report wind direction as magnetic. "VRB" in this place indicates variable winds less than or equal to 6 knots. If wind direction is varying more than 60° with speeds over 6 knots, an entry similar to "180V260" will be displayed in this place. This example actually shows wind direction varying by 80°.

15 is the 2 or 3 digit wind speed (in knots).

25 is the 2 or 3 digit wind gust speed in knots (**KT**) because it follows a **G** (Gust).

6. Visibility: **3/4SM R28R/2600FT**

3/4 indicates 3/4 statute mile (**SM**) visibility.

Runway Visual Range (RVR) for **R28R** (runway 28 right) is 2600 feet (**2600FT**). An "M" in this distance number indicates visibility is less than the lowest reportable sensor value. A "P" indicates visibility is greater than the highest reportable sensor value.

NOTE: Only reported at those locations with certified RVR reporting capability.

7. Significant Present Weather: **TSRA**

TS is a two letter designation for thunderstorm. Other possible designations could be as follows:

BC   Patches
BL   Blowing
DR   Low Drifting
FZ   Supercooled/Freezing
MI   Shallow
PR   Partial
SH   Showers

The second two letter designator, **RA,** indicates moderate rain. Moderate is indicated by the absence of a "+", "-" or "VC" preceding the designation. These preceding designations represent the following:

+   Heavy
-    Light
VC   In the vicinity

Other possible designations could be as follows:

BR   Mist
DS   Dust Storm
DU   Widespread Dust
DZ   Drizzle
FC   Funnel Cloud
+FC Tornado/Water Spout
FG   Fog
FU   Smoke
GR   Hail
GS   Small Hail/Snow Pellets
HZ   Haze
IC   Ice Crystals
PE   Ice Pellets
PO   Dust/Sand Whirls
PY   Spray
SA   Sand
SG   Snow Grains
SN   Snow
SQ   Squall
SS   Sandstorm
UP   Unknown Precipitation (Automated Observations)
VA   Volcanic Ash

8. Sky Condition: **OVC010CB**

   OVC indicates the sky is overcast. Cloud cover is based on the sky being divided into eighths or octas. Overcast means the sky is 8 octas covered. The cloud cover designators are as follows:

   SKC Sky Clear
   CLR Clear below 12,000 ft. (automated observing systems)
   FEW 1-2 Octas
   SCT 3-4 Octas
   BKN 5-7 Octas
   OVC 8 octas

   "VV" may also be encountered here indicating an indefinite ceiling. For example, VV004 would indicate a vertical visibility of 400 feet.

   010 indicates clouds are at 1000 feet.

   CB denotes cloud type is cumulonimbus. "TCU" is another possible designator meaning towering cumulus. CI is cirrus.

9. Temperature/Dew Point: **18/16**

   18 indicated the temperature is 18° Celsius. An "M" preceding the temperature means the temperature is below 0° Celsius.

   16 indicated the dew point is 16° Celsius. An "M" preceding the dew point means the dew point is below 0° Celsius.

10. Altimeter Setting: **A2992**

    A indicates the setting is in inches of mercury.

    2992 is the altimeter setting. The first two digits are inches and the second two are hundredths.

11. Remarks: **RMK SLP013 T01760158 PK WND 22030/15**

    RMK designates the beginning of the remarks. Remarks can contain anything, but often include the following:

    SLP indicates sea level pressure in millibars from selected stations.

    013 indicates pressure is 1001.3 millibars.

    T01760158. Selected stations may also include a 9 place code indicating temperature and dewpoint to the nearest 1/10 degree. **T** denotes temperature. **0** indicates temperature is above 0° Celsius. A "1" in this position indicates a temperature below 0° Celsius. **176** indicates a temperature of 17.6° Celsius. The next **0** indicates the dew point is above 0° Celsius. A "1" in this position indicates a dew point below 0° Celsius. **158** indicates a dewpoint of 15.8° Celsius.

    PK WND 22030/15. Selected stations may include peak wind observations which will appear in the remarks element.

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PK WND denotes peak wind.

200 indicates wind direction from 200°.

30/15 indicates a maximum instantaneous wind of 30 knots occurred at 15 minutes past the hour.

UNDERSTANDING TAFS

Refer to the numbers on the following diagram to find the appropriate descriptions.

1	2	3	4	5	6	7	8
TAF	KPIT	091730Z	091818	22020KT	3SM	-SHRA	BKN020

FM2030 30015G25KT 3SM SHRA OVC015 WS015/30045KT —20

19 — TEMPO 2022 1/2SM TSRA OVC008CB

FM0100 27008KT 5SM -SHRA BKN020 OVC040 PROB40 0407 —21
00000KT 1SM -RA BR

10 ———

9 — FM1000 22010KT 5SM -SHRA OVC020 BECMG 1315 20010KT
P6SM NSW SKC

| 16 | 17 | 18 | 11 | 12 | 13 | 14 | 15 |
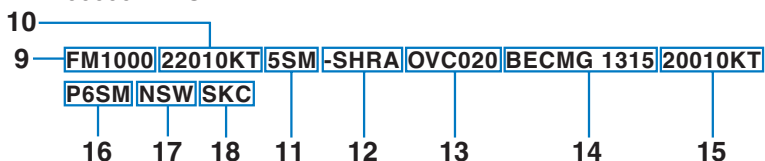
1. Type of Report: **TAF**

    TAF indicates a Terminal Area Forecast. TAF AMD indicates an amended forecast.

2. ICAO Station Identifier: **KPIT**

    This is the airport for which the TAF pertains.

3. Date and Time of Issue: **091730Z**

    The **9**th day of the month at **1730Z**ulu or UTC.

4. Date and Time Valid: **091818**

    The **9**th day of the month, valid for 24 hours from 09**18**00Z to 10**18**00Z. An amended forecast (TAF AMD) will be valid for only the time interval remaining, usually less than 24 hours.

5. Forecast Wind: **22020KT**

    See #5 in the UNDERSTANDING METARs section for details.

6. Forecast Visibility: **3SM**

    See #6 in the UNDERSTANDING METARs section for details, except RVR is not included in a TAF

7. Forecast Weather Phenomenon: **-SHRA**

See #7 in the UNDERSTANDING METARs section for details.

8. Sky Conditions: **BKN020**

See #8 in the UNDERSTANDING METARs section for details.

9. Beginning of Changed Forecast Conditions: **FM1000**

FM denotes "from" and **1000** indicates 1000Z. "From" means a significant change in prevailing conditions is expected. The described conditions follow this element and supercede all previous forecast conditions.

10. Forecast Wind: **22010KT**

See #5 in the UNDERSTANDING METARs section for details.

11. Forecast Visibility: **5SM**

See #6 in the UNDERSTANDING METARs section for details.

12. Forecast Weather Phenomenon: **-SHRA**

See #7 in the UNDERSTANDING METARs section for details.

13. Forecast Sky Conditions: **OVC020**

See #8 in the UNDERSTANDING METARs section for details.

14. Change in Conditions: **BECMG 1315**

BECMG indicates "becoming" over the time interval between 1300Z (**13**) and 1500Z (**15**). "Becoming" describes a gradual change in forecast conditions. The described conditions follow this element and supercede previously reported like elements.

15. Wind Becoming: **20010KT**

See #5 in the UNDERSTANDING METARs section for details. This element may be omitted if no change is expected.

16. Visibility Becoming: **P6SM**

See #6 in the UNDERSTANDING METARs section for details. This element may be omitted if no change is expected.

17. Weather Phenomenon Becoming: **NSW**

NSW indicates "No Significant Weather". See #7 in the UNDERSTANDING METARs section for details.

18. Sky Conditions Becoming: **SKC**

See #8 in the UNDERSTANDING METARs section for details. This element may be omitted if no change is expected.

19. Change in Conditions: **TEMPO 2022**

TEMPO indicates "temporary" changes expected as described between 2000Z (**20**)and 2200Z (**22**). "Temporary" indicates a temporary fluctuation in conditions, usually lasting less than one hour.

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The described conditions follow this element.

20. Low Level Windshear: **WS015/30045KT**

WS indicates "windshear" not associated with convective activity. **015** indicates the windshear is expected at 1500 feet. AGL Wind is expected from 300° (**300**) at 45 knots (**45KT**).

21. Change in Conditions: **PROB40 0407**

PROB40 indicates a 40% "probability" of described conditions occurring between 0400Z (**04**)and 0700Z (**07**). The described conditions follow this element.

UNDERSTANDING PIREPS

The following is an example of a typical PIREP with an explanation of the elements.

1 **2** **3**

KCRW UA/OV KBKW 360015-KCRW/TM 1815/FL120/TP BE99/SK IMC/

WX RA/TA M08/WV 290030/TB LGT-MDT/IC LGT RIME/RM MDT MXD

ICG DURGC KROA NWBND FL080-100 1750Z

1. Station Identifier: **KCRW**

This is the station identifier of the nearest weather reporting location to the reported conditions.

2. Report Type: **UA**

Reports will be routine (UA) or urgent (UUA).

3. Location: **OV KBKW 360015-KCRW**

OV indicates the report is in relation to a VOR. **KBKW** is the VOR identifier, in this case Beckley VOR. **360015-KCRW** indicates position as related to the VOR. In this case, **15** miles out on the **360** degree radial. **KCRW** indicates this is a leg to the Charleston, West Virginia VOR.

The next series of elements contain data that is read much like that in METARs and TAFs. Each element starts with a 2-letter designator which denotes the type of data with that element. The following defines the element designators:

/TM: Time as Coordinated Universal Time

/FL: Altitude as Flight Level

/TP: Aircraft Type

/SK: Sky Cover (may include cloud height and coverage)

/WX: Weather Phenomenon (can include flight visibility, precipitation and restrictions to visibility.

/TA: Outside air temperature at altitude in degrees Celsius.

/WV: Wind (direction in degrees magnetic north and speed in knots)

/TB: Turbulence (refer to the Airman's Information Manual)

CAT - Clear Air Turbulence

CHOP - Choppy Turbulence

OCNL - Occasional

NEG - No Turbulence

ABV - Above

BLO - Below

LGT - Light - Momentarily causes slight, erratic changes in altitude and/or attitude.

MOD - Moderate - Greater intensity changes in altitude and/or attitude, but aircraft remains in positive control at all times. Usually causes changes in indicated airspeed.

SEV - Severe - Causes large and abrupt changes to aircraft altitude and/or attitude. Large variations in indicated airspeed and momentary loss of control.

EXTRM - Extreme - Aircraft is violently tossed about and is nearly impossible to control. May cause structural damage.

/IC: Icing (refer to the Airman's Information Manual)

CLR - Clear

MX - Mixed (combination of rime and clear icing)

NEG - No Icing

ABV - Above

BLO - Below

Trace - Ice becomes perceptible. Rate of evaporation is almost equal to the rate of accumulation. Deicing/anti-icing equipment is not utilized unless encountered for a period of time greater than 1 hour.

LGT - Light - Rate of accumulation may be a problem if flight is prolonged for longer than 1 hour without deicing/anti-icing equipment. Deicing/anti-icing removes and/or prevents accumulation.

MOD - Moderate - The rate of accumulation is such that even short encounters become potentially hazardous. Use of deicing/anti-icing equipment or diversion is necessary.

SEV - Severe - Flight diversion is necessary. Deicing/anti-icing equipment is not effective.

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/RM: Remarks (for reporting elements not included or to clarify pre-viously reported items). Remarks can include anything. The example translates to "moderate (**MDT**) mixed (**MXD**) icing during climb (**DURGC**) from Roanoke, VA (**KROA**) northwestbound (**NWBND**) between Flight Level 080 and 100 (**FL080100**) at **1750Z**".

UNDERSTANDING AIRMETS

The following is an example of a typical AIRMET with an explanation of the elements.

```
    1   2    3     4

  CHIT WA 151900 AMD
```

5 — AIRMET TANGO UPDT 2 FOR TURB

6 — VALID UNTIL 160100

7 — AIRMET TURB...KS MO

8 — FROM MCI TO STL TO SGF TO ICT TO MCI

9 — MOD TURB BLW 100 EXPCD

10 — CONDS IPVG AFT 160000Z

1. Forecast Area: **CHIT**

This is the forecast area identifier of the issuing Weather Service Forecast Office.

BOS   Boston
CHI   Chicago
DFW   Dallas/Ft. Worth
MIA   Miami
SFO   San Francisco
SLC   Salt Lake City

The **T** denotes the reason for the AIRMET. This could be one of the following:

S	Sierra	IFR	Ceilings < 1,000 feet and/or visibility < 3 miles affecting > 50% of the area at one time or extensive mountain obscu-ration.
T	Tango	Turbulence	Moderate turbulence, sustained suface winds of ≥ 30 knots at the surface or low level windshear.
Z	Zulu	Icing	Moderate icing and/or freezing levels.

AIRMET items are considered widespread. Widespread is consid-ered an area ≥ 3,000 square miles.

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2. Report Type: **WA**

WA identifies an AIRMET.

3. Date and Time Issued: **151900**

15 indicates the 15th day of the month. **1900** indicates UTC.

NOTE: AIRMETs may be issued up to 15 minutes prior to the start of the validity period. The FIS system will display the data age as zero until the start of the validity period.

4. **AMD** indicates an amended report. Reports can be amended due to changing weather conditions or issuance/cancelation of a SIGMET. **COR** in this field would indicate a corrected AIRMET. **RTD** indicates a delayed AIRMET.

5. This line indicates that there is a second (**2**) update (**UPDT**) to this **AIRMET** issued for turbulence (**FOR TURB**). More than one meteorological condition may be addressed as shown in the following:

    FOR IFR AND MTN (mountain) **OBSCN** (obscuration)

    FOR ICE AND FRZLVL (freezing level)

    FOR STG (strong) **SFC** (surface) **WINDS AND LLWS** (low level   wind shear)

6. This updated AIRMET is valid until **0100** UTC on the 16th day (**16**) of the month. An AIRMET does not contain an explicit validity start time.

7. This **AIRMET** forecasts turbulence (**TURB**) for the states of **KS** (Kansas) and **MO** (Missouri). Geographic areas are also covered such as CSTL WTRS (coastal waters). Other geographic abbreviations are used as well (see Appendix A).

8. The affected area is defined by lines **FROM MCI** (Kansas City) **TO STL** (St. Louis) **TO SGF** (Springfield) **TO ICT** (Wichita) and back **TO MCI**. Areas can be defined by lines between points which are airport or navaid identifiers.

9. Moderate (**MOD**) turbulence (**TURB**) below (**BLW**) 10,000 feet expected (**EXPCD**).

10. Conditions (**CONDS**) improving (**IPVG**) after (**AFT**) the 16th day (**16**) of the month **0000** UTC.

If conditions end more than one hour prior to the indicated expiration time, an amended AIRMET will be issued stating it's cancellation. If conditions end within one hour of the indicated expiration time, the AIRMET will be allowed to expire without cancellation. Once the report is cancelled or expires, the FIS system no longer broadcasts the report.

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UNDERSTANDING SIGMETS

The following is an example of a typical SIGMET issued for turbulence with an explanation of the elements.

1   2   3

CHIR UWS 041430

4 — **SIGMET ROMEO 1 VALID UNTIL 041830**

5 — **KY TN WV VA OH**

6 — **FROM CVG TO EKN TO PSK TO VXV TO CVG**

7 — **OCNL SEV TURB BTN 300 AND 360. RPRTD BY AIRCRAFT.**
CONDS CONTG BYD 1830Z.

8 — **SLM/GTB**
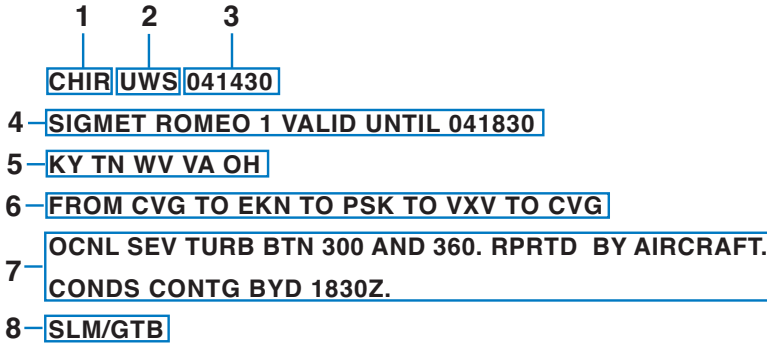
1. Forecast Area: **CHIR**

This is the forecast area identifier of the issuing Weather Service Forecast Office.

BOS   Boston
CHI   Chicago
DFW   Dallas/Ft. Worth
MIA   Miami
SFO   San Francisco
SLC   Salt Lake City

The **R** denotes report ROMEO. A new alphabetic designator is given each time a SIGMET is issued for a new weather phenomenon. The order of issuance is as follows:

N NOVEMBER
O OSCAR
P PAPA
Q QUEBEC
R ROMEO
U UNIFORM
V VICTOR
W WHISKEY
X XRAY
Y YANKEE

SIGMETs are issued for:

Severe icing not associated with thunderstorms

Severe or extreme turbulence or clear air turbulence (CAT)

Dust storms or sandstorms lowering visibilities to < 3 miles

Volcanic ash

2. Report Type: **UWS**

UWS indicates this is the first issuance of report ROMEO. Subsequent reports for ROMEO would display **WS**.

3. Date and Time Issued: **041430**.

04 indicates the 4th day of the month. **1430** indicates UTC.

4. This line indicates that **SIGMET ROMEO 1** is **VALID UNTIL** the 4th day (**04**) of the month at **1830** UTC.

Each subsequent report issued for this same weather phenomenon designated **ROMEO** would increment the number. For example, ROMEO 2, ROMEO 3 and so on.

5. Area of coverage by state or geographic area. In addition to state abbreviations, other area abbreviations may be seen here, such as, TX CSTL WTRS (Texas Coastal Waters).

6. Location of weather phenomenon. Three letter designators for navaids or airports are used to describe boundaries of coverage. If the weather phenomenon extends across multiple forecast areas, the location is described as if no boundaries exist.

7. Details of weather phenomenon. The example is typical of a synopsis for turbulence:

OCNL (occasional) **SEV** (severe) **TURB** (turbulence) **BTN** (between) **300** (30,000 feet) **AND 360** (36,000 feet). **RPRTD** (reported) **BY AIRCRAFT. CONDS** (conditions) **CONTG** (continuing) **BYD** (beyond **1830Z.**

More typical examples of descriptors used in other SIGMET weather phenomenon are as follows:

MOD (moderate) TO
STG (strong) UDDFS (updrafts and downdrafts)
UPDFTS (updrafts)
DWNDFTS (downdrafts)
INVOF (in vicinity of) MTNS (mountains)
BLO (below) 360
BTWN (between) FRZLVL (freezing level) AND 360
ABV (above) 360
RPRTD (reported) BY ACFT (aircraft) IN VCNTY (vicinity)
RPRTD BY SVRL (several) ACFT

8. Issuers initials.

If conditions end more than one half hour prior to the indicated expiration time, and the report does not state that conditions will continue, a cancellation will be issued with CNCL SIGMET as the report designator. If conditions are expected to continue, a new SIGMET will be issued. If conditions end within one half hour of the indicated expiration time, the SIGMET will be allowed to expire without cancellation. Once the report is cancelled or expires, the FIS system no longer broadcasts the report.

<div style="text-align: right">Section 2
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UNDERSTANDING CONVECTIVE SIGMETS

The following is an example of a typical Convective SIGMET with an explanation of the elements.

1   2   3

MKCC WST 221855

4 — CONVECTIVE SIGMET 20C

5 — VALID UNTIL 2055Z

6 — ND SD

7 — FROM 60W MOT-GFK-ABR-90W MOT

8 — INTSFYG AREA SVR TSTMS MOVG FROM 2445. TOPS ABV FL450. WIND GUSTS TO 60KT RPRTD. TORNADOES...HAIL TO 2 IN...WIND GUSTS TO 65KT PSBL ND PTN.
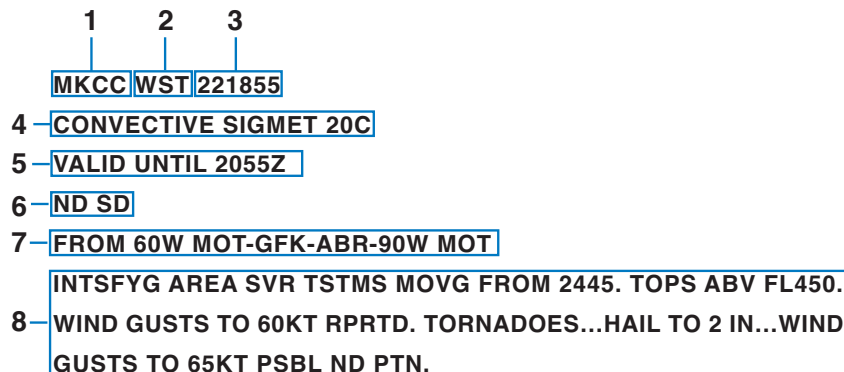
1. Station Identifier: **MKCC**

MKC is the station identifier of the Aviation Weather Center (AWC) in Kansas City.

The **C** denotes the report is for the Central portion of the continental United States. The choices are as follows:

C Central
E East
W West

Convective SIGMETs are issued for:

Severe weather including: (a)Surface winds ≥ 50 knots, (b) Surface hail ≥ 3/4 inch in diameter or (c) Tornadoes

Embedded thunderstorms (obscured by haze or other phenomena)

Line of thunderstorms

Thunderstorms ≥ VIP level 4 affecting ≥ 40% of an area ≥ 3000 sq. mi.

2. Report Type: **WST**

WST indicates this is a convective SIGMET.

3. Date and Time Issued: **221855**.

22 indicates the 22nd day of the month. **1855** indicates UTC.

4. This line is the identifying number of the Convective SIGMET. Numbering begins daily at 0000 UTC. The **C** denotes the Central portion of the country.

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5. This line indicates that **CONVECTIVE SIGMET 20C** is **VALID UNTIL 2055Z** time. Expiration time is two hours after issuance, but Convective SIGMETs are issued hourly and replace the previous hour's product.

   Each subsequent report issued for this same weather phenomenon would increment the number. For example, 21C, 22C and so on.

6. Area of coverage by state **ND** (North Dakota) and **SD** (South Dakota) or geographic area. In addition to state abbreviations, other area abbreviations may be seen here, such as **FL CSTL WTRS** (Florida Coastal Waters).

7. Location of weather phenomenon (may be an area, single cell or line). Three letter designators for navaids or airports are used to describe boundaries of coverage.

   The starting and ending point are identical for an <u>area</u> of thunderstorms, like this: **FROM 90W MOT-GFK-ABR-90W MOT** (from 90 nm west of Minot, ND to Grand Forks, ND to Aberdeen, SD to 90 nm west of Minot, ND).

   A <u>Single Cell</u> thunderstorm 35 nm west of Kansas City would look like this: **35WMKC**

   A <u>Line</u> of severe thunderstorms would look like this: **FROM 90SE SGF-70NE TXK-50NE LFK** (from 90 nm southeast of Springfield, MO to 70 nm northeast of Texarkana, AR to 50 nm northeast of Lufkin, TX).

8. Details of weather phenomenon. Convective SIGMET details are mostly in plain language with some abbreviations. This example is typical for an area of severe thunderstorms:

   INTSFYG (intensifying) **AREA** (of) **SVR TSTMS** (severe thunderstorms) **MOVG** (moving) **FROM 2445** (240 degrees at 45 knots). Storm **TOPS ABV** (above) **FL450** (flight level 4-5-0). **WIND GUSTS TO 60KT** (knots) **RPRTD** (reported). **TORNADOES…HAIL TO 2 IN** (inches in diameter)**…WIND GUSTS TO 65 KT** (knots) **PSBL** (possible) in the **ND PTN** (North Dakota portion).

   For a single cell thunderstorm:

   ISOLD (isolated) **SVR TSTM** (severe thunderstorm) **D30** (30 nm in diameter) **MOVG** (moving) **FROM 2520** (250 degrees at 20 knots). Storm **TOPS ABV** (above) **FL450** (flight level 4-5-0). **HAIL TO 2 IN** (inches in diameter) **WIND GUSTS TO 65 KT** (knots) **PSBL** (possible).

   For a line of thunderstorms 25 nm wide:

   LINE (line of) **SVR TSTMS** (severe thunderstorms) **25 MI WIDE MOVG** (moving) **FROM 2745** (270 degrees at 45 knots). Storm

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TOPS ABV (above) **FL450** (flight level 4-5-0). **WIND GUSTS TO 60KT** (knots) **RPRTD** (reported). **TORNADOES...HAIL TO 2 IN** (inches in diameter)**...WIND GUSTS TO 65 KT** (knots) **PSBL** (possible).

UNDERSTANDING ALERT WEATHER WATCHES (AWW)

The following is an example of a typical Alert Weather Watch with an explanation of the elements.

```
   1     2      3                    5
 SPC  AWW  162236
4 WW 1162 SEVERE TSTM MS AL FL AND ADJ CSTL WTRS
6 162300Z - 170400Z
  AXIS..75 STATUTE MILES NORTH AND SOUTH OF LINE..
7
  45SW MOB/MOBILE AL/ - 30SSE DHN/DOTHAN AL/
8 ..AVIATION COORDS.. 65NM N/S /37SW MOB - 51WNW TLH/
  HAIL SURFACE AND ALOFT..1 1/4 INCHES. WIND GUSTS..60
9
  KNOTS. MAX TOPS TO 400. MEAN WIND VECTOR 23035.
```

1. Station Identifier: **SPC**

   SPC is the station identifier for the Storm Prediction Center in Norman, Oklahoma.

   AWWs are issued for:

   Tornado
   Damaging winds or winds > 58 knots
   Hail ≥ 3/4 inch in diameter.

2. Report Type: **AWW**

   AWW indicates this is an Alert Weather Watch.

3. Date and Time Issued: **162236**.

   16 indicates the 16th day of the month. **2236** indicates UTC.

4. **WW 1162** is the identifying number of the Alert Weather Watch. Numbering begins yearly at 0000.

5. This line indicates the type of weather and the affected areas. **SEVERE TSTM** (severe thunderstorm) for **MS** (Mississippi) **AL** (Alabama) **FL** (Florida) **AND ADJ CSTL WTRS** (adjacent coastal waters).

6. This line indicates that the watch is valid from **162300Z - 170400Z**

(the 16th at 2300 Zulu to the 17th at 0400 Zulu).

7. Coordinates of the watch box area. Draw a line **75 STATUTE MILES NORTH AND SOUTH OF A LINE..** The endpoints of the line are **45SSW MOB/MOBILE AL/-30SSE DHN/DOTHAN AL/** (45 miles south-southwest of Mobile, Alabama and 30 miles south-southeast of Dothan, Alabama). Connect the lines to form the box. Sometimes it might be defined as **EAST AND WEST OF A LINE..** or **EITHER SIDE OF A LINE..**

8. Aviation coordinates of the watch box area. Draw a line **65NM N/S /** (65 nautical miles north and south) of a line). The endpoints of the line are **37SW MOB - 51WNW TLH/** (37 nautical miles southwest of Mobile, Alabama and 51 nautical miles west-northwest of Tallahassee, Florida). Connect the lines to form the box.

9. Details of the forecast weather. AWW details are mostly in plain language with some abbreviations. This is an example of a typical product.

   HAIL SURFACE AND ALOFT..1 1/4 INCHES (hail diameter potential of one and one quarter inches) **WIND GUSTS..60 KNOTS** (wind gust potential of 60 knots) **MAX TOPS TO 400** (maximum tops of the storms is 40,000 feet). **MEAN WIND VECTOR 23035** (motion of storm is 230 degrees at 35 knots).

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SECTION 3
TRAFFIC AVOIDANCE OPERATION

INTRODUCTION

The Traffic Function of the Bendix/King KMD 250 Multi Function Display allows for the display and control of one of several models of traffic avoidance systems. Some examples are TCAS I (Traffic Collision Avoidance System), TCAS II, TAS (Traffic Avoidance System) and TIS (Traffic Information Service).

This section describes the operation of the KMD 250 display for controlling the display of traffic. For detailed information on the proper use and interpretation of the displayed traffic data when using TCAS I, TCAS II and TAS systems, please reference the pilot's guide that is provided with the traffic avoidance system.

An active traffic avoidance system (TCAS I, TCAS II or TAS) is used for detecting and tracking aircraft near your own aircraft. Aircraft detected, tracked, and displayed are referred to as Intruders. Intruders are shown as symbols on the traffic display. The system identifies the relative threat of each Intruder by using various symbols and colors. The intruder's altitude, relative to your own aircraft's altitude, is annunciated if the Intruder is reporting altitude. A trend arrow is used to indicate if the Intruder is climbing or descending more than 500 feet per minute.

The passive Traffic Information Service (TIS) is a data link service that provides information similar to VFR radar traffic advisories normally received over voice radio. The data is received from the terminal Mode S radar system through a TIS capable Mode S transponder to the KMD display once per radar scan (approximately every 5 seconds).

TIS provides the relative position, relative altitude, altitude trend, and estimated ground track angle for as many as 8 intruders that are within 7 NM horizontally and +3,500/-3000 feet vertically of the aircraft receiving TIS. Only aircraft with operating transponders that are within the surveillance volume of a TIS Mode S radar are visible to TIS. Terminal Mode S radars equipped with TIS provide the service to 55 NM (or possibly greater) of the radar location, and as low as the "line of site" limitation inherent to radar surveillance.

ATC procedures and the "see and avoid concept" will continue to be the primary means of ensuring aircraft separation. However, if communication is lost with ATC, TCAS/TAS/TIS adds a significant backup for collision avoidance.

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The Bendix/King KMD 250 is shown below with the Traffic Page for TAS/TCAS selected.

The Bendix/King KMD 250 is shown below with the Traffic Page for TIS selected.

TRAFFIC FUNCTION STATUS ICONS

The Traffic Function Status Icons are located in the lower left of the display. They are used to indicate whether or not the KMD 250 is currently receiving and/or displaying traffic information. The following table shows the various traffic icons and their meanings:

Icon	Colors	Text	Description
	Black on cyan	TRFC	Active traffic information being displayed.
	Black on cyan	TRFC STBY	The Traffic Page is currently being displayed and the traffic sensor is turned off or in standby mode.
	Black on gray	TRFC STBY	Traffic sensor in standby mode, not being displayed.
	Black on gray	TRFC	Traffic Sensor is active, but data is not being displayed.
	Black on Yellow	TRFC N/A	TIS traffic is not available, the transponder is not receiving the TIS uplink information.
	Flashing Black on Yellow	TRFC ALRT	A TA Traffic Alert is active. The icon will be flashing.
	Flashing Black on Red	TRFC ALRT	A RA Traffic Alert is active (TCAS II system only). The icon will be flashing.
	Black on gray with red slash	TRFC FAIL	Traffic sensor data invalid / not being displayed.

TAS/TCAS

This section applies to TAS, TCAS I and TCAS II systems.

TAS/TCAS NORMAL OPERATION

TRFC To display the TCAS/TAS traffic page press the **TRFC** function select key.

The following illustration defines the data that appears on the TAS/TCAS Traffic Display Page:
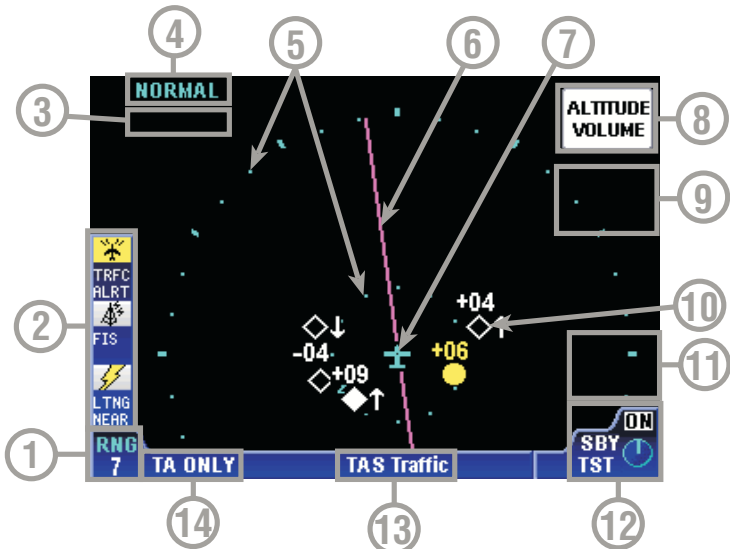
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1 Display Range - **RNG:####**.
2 Function Status Icons - Displays icons representing data available and displayed.
3 Current Flight Level - **FL ###**
4 Altitude Volume - Current Altitude Volume selection is displayed in this field.
5 Range Rings - Outer ring radius is selected range, inner ring radius is always 2 nm.
6 Active Flight Plan
7 Aircraft Symbol - Indicates present position.
8 Altitude Volume Softkey - When the **ALTITUDE VOLUME** softkey is pressed, the display will step through **NORMAL**, **ABOVE**, **BELOW** and **UNRESTRICTED**.
9 Flight Level Softkey - Pressing **FLIGHT LEVEL** toggles the Flight Level display on or off.
10 Traffic Intruder Symbols - Indicates type of traffic, altitude of traffic, vertical trend of traffic and ground track of traffic.
11 Pop-Up Softkey - Pressing the **MENU** Key will display the pop-up softkey. Pressing this softkey will toggle between **DISABLE POP-UP** and **ENABLE POP-UP**. When enabled, the Traffic Page will be displayed whenever there is a traffic alert.
12 System ON/SBY/TST - Rotary Knob selects system **ON**,**SBY** (standby) or **TST** (test).
13 Page Display Name
14 System Operating Mode - If using a TAS system, **TAS TST**, **TAS SBY**, **TA ONLY** or **TAS FAIL** will be displayed. If using a TCAS system, **TCAS TST**, **TCAS SBY**, **TA ONLY**, **TA/RA**, or **TCAS FAIL** will be displayed.

OPERATIONAL CONTROLS FOR TAS/TCAS

ALTITUDE VOLUME - Toggles between altitude volume views of **NORMAL**, **ABOVE**, **BELOW** or **UNRESTRICTED**. This key may be enabled or disabled in system configuration.

FLIGHT LEVEL - Pressing the **MENU** Key will display the **FLIGHT LEVEL** Softkey. Pressing this key toggles the altitude tag between relative or absolute altitude as shown in Figures 3-1 and 3-2. When absolute altitude is displayed, the Flight Level will also be displayed in the upper left of the screen. Operation in the absolute mode is limited to 15 seconds. This feature may be enabled or disabled in system configuration. See note below.

NOTE: If **FLIGHT LEVEL** *or* **ALTITUDE VOLUME** *Soft Keys or the Rotary Knob are not active, these controls will be found on the separate TAS/TCAS controller.*

AUTO-POP-UP - Toggles between **ENABLE POP-UP** and **DISABLE POP-UP**. When enabled the Traffic Display will automatically be displayed in a Traffic Alert situation. In some situations, like high traffic areas or flying in formation, this frequent display changing could be a nuisance. Disabling the pop-up may desirable in these circumstances. This key may be enabled or disabled in system configuration.

RNG▲/RNG▼ - Advances the indicator to the next range. The upper button increases range, the lower button decreases it. The selected range is displayed in the lower left corner of the display with the inner range ring always 2 nm. The **RNG** button labels will not be displayed when their respective range limits are reached.

Rotary Knob - Selects between Test (**TST**), Standby (**SBY**) and **On** mode of operation. This control may be enabled or disabled in system configuration. If the KMD 250 is used with a TCAS II or L-3 Skywatch™ system, this control will not be available.

Figure 3-1
Relative Altitude Mode

Figure 3-2
Absolute Altitude Mode

TAS/TCAS SYMBOLOGY
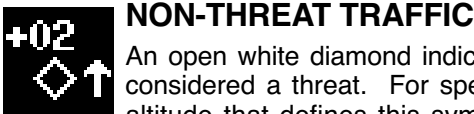
NON-THREAT TRAFFIC

An open white diamond indicates that an intruder is not yet considered a threat. For specifics on relative distance and altitude that defines this symbol, please refer to the pilot's guide that is provided with the traffic avoidance system. This one is 200 feet above your own altitude, climbing at 500 feet per minute or greater.
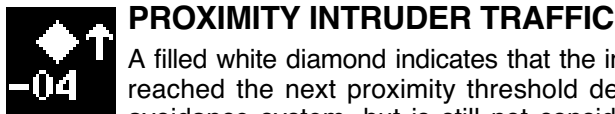
PROXIMITY INTRUDER TRAFFIC

A filled white diamond indicates that the intruding aircraft has reached the next proximity threshold defined by the traffic avoidance system, but is still not considered a threat. For specifics on relative distance and altitude that defines this symbol, please refer to the pilot's guide that is provided with the traffic avoidance system. This intruder is now 400 feet below your aircraft and climbing at 500 feet per minute or greater.
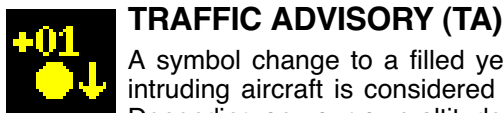
TRAFFIC ADVISORY (TA)

A symbol change to a filled yellow circle indicates that the intruding aircraft is considered to be potentially hazardous. Depending on your own altitude the system will display a TA when time to Closest Point of Approach (CPA) is reached as defined by traffic avoidance system. For specifics on CPA as defined by the system, please refer to the pilot's guide that is provided with the traffic avoidance system. Here the intruder is 100 feet above your aircraft, descending at 500 feet per minute or greater.
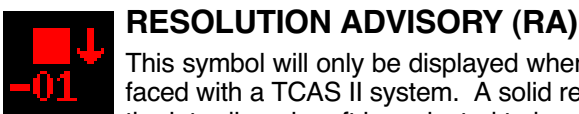
RESOLUTION ADVISORY (RA)

This symbol will only be displayed when the KMD 250 is interfaced with a TCAS II system. A solid red square indicates that the intruding aircraft is projected to be a collision threat. TCAS

II calculates that the intruder has reached a point where a Resolution Advisory is necessary. The time to CPA with the intruder, depending on your altitude, has been reached as defined by the traffic avoidance system. For specifics on CPA as defined by the system, please refer to the pilot's guide that is provided with the traffic avoidance system. The symbol appears together with an appropriate audio warning and a vertical maneuver indication on the RA/VSI. This aircraft is now 100 feet below your altitude and still descending at 500 feet per minute or greater.

NOTE: An intruder must be reporting altitude in order to generate an RA. Therefore, the RA symbol will always have an altitude tag.

"OFF-SCALE" TRAFFIC

TA or RA traffic that is beyond the selected range will be displayed as half the appropriate symbol at the edge of the display matching the bearing of the traffic.

"NO-BEARING" TRAFFIC

If the bearing of TA or RA traffic cannot be determined by the traffic avoidance system, no traffic symbol will be displayed on the TRFC display. The traffic information will instead be displayed in the lower center of the display as shown in Figure 3-3. A maximum of two "no-bearing" TA

Figure 3-3

and/or RA intruders can be displayed. If the intruder is not reporting altitude, the altitude and trend arrow fields will be blank.
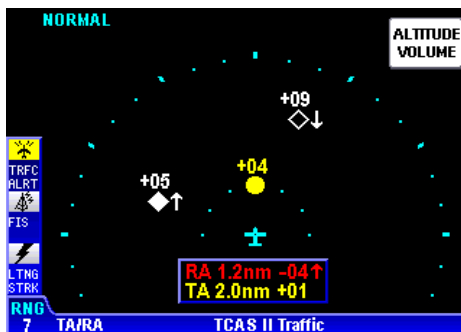
NOTE: "Off-Scale" and "No-Bearing" advisories are displayed only on the TRFC Page.

TA/RA WHILE IN MAP OR WEATHER DISPLAY

If a Traffic Advisory presents itself while in the Map or Weather Display the traffic function icon in the Functions Legend will flash yellow along

Figure 3-4

with **ALERT** as represented in Figure 3-4. In the case of a Resolution Advisory in a TCAS II system, the icon will flash red.

AUTO-POP-UP

If AUTO-POP-UP is enabled, a TA or RA will cause the Traffic Display to be presented automatically. The default range of the pop-up display will be 7 nm.

To enable AUTO-POP-UP perform the following:

1. While viewing the Traffic Display, press the **MENU** Key to display the **ENABLE POP-UP** Softkey as shown in Figure 3-5. This Softkey toggles between **ENABLE** and **DIS-ABLE POP-UP**.
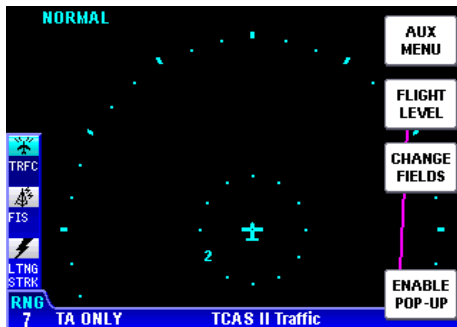
VIEWING TRAFFIC IN A DATA FIELD

Traffic may be selected for viewing in a Data Field as shown in Figure 3-6 (also see Section 1 for displaying Data Fields). Altitude tags and vertical trend arrows will not be shown with traffic symbol in the Data Field display.

Traffic will not be available in the Data Field if the Map Orientation is set to North Up. If the Map Display is in North Up mode, the Traffic Data Field will appear as shown in Figure 3-7.

Figure 3-5

Figure 3-6

Figure 3-7

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TAS/TCAS SYSTEM FAULTS

NO DATA RECEIVED

If the KMD 250 is not receiving any data from the TCAS or TAS sensor then a screen similar to Figure 3-8 will be displayed. This could indicate that power is not being provided to the traffic avoidance system (e.g. a pulled breaker), a bad wiring connection between the display and the sensor, or a failed TCAS or TAS unit.

Figure 3-8

SYSTEM TEST

A system test can be performed to verify the traffic avoidance system is working properly. If the KMD 250 is configured to use the Rotary Knob with the traffic function, turn the outer knob to select **TST**. Figure 3-9 indicates a properly functioning TCAS I/TAS system. An RA will be displayed for a TCAS II system. If the KMD 250 not configured for use of the Rotary Knob with the traffic function, this test would be performed using the appropriate control unit.

Figure 3-9

If faults are detected in the KMD 250 or the traffic sensor they will be displayed as shown in Figure 3-10. This figure shows all faults. Only actual faults will be displayed.
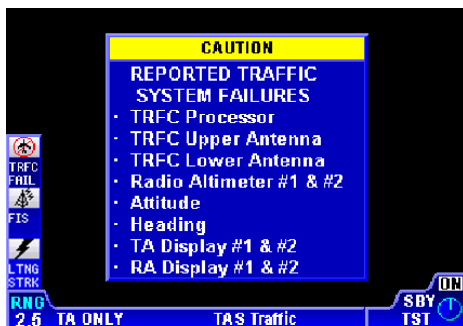
Figure 3-10

TRAFFIC INFORMATION SERVICE (TIS)

This section applies only to TIS systems.

TIS is an alerting system that provides visibility to nearby traffic enhancing "see and avoid" collision avoidance. It's purpose is to increase situational awareness by supplying information to assist in visually acquiring nearby aircraft. TIS does not relieve the pilot of "see and avoid" responsibility. No avoidance maneuvers are provided or recommended by TIS.

The service is offered through the Federal Aviation Administration's Mode S terminal sensors and uses the same surveillance information provided to ATC. Estimated bearing, distance, altitude and heading information for aircraft within 7 NM and +3,500/-3,000 feet altitude of your aircraft is sent over the Mode S datalink to the TIS display. The pilot is also alerted to aircraft that are predicted to be within 30 seconds of a potential collision, no matter the distance or altitude.

Mode S Sensor

TIS ALGORITHMS

KMD 250 w/ TIS Display

KT 73 Mode S
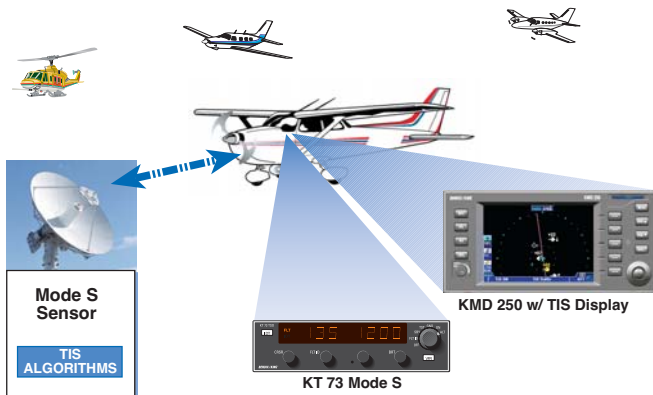
Target aircraft are displayed only if operating a Mode A, C or S transponder. TIS operation is transparent to ATC and requires no controller intervention.

When the onboard TIS system makes a request for TIS, the request is sent via the Mode S transponder through the datalink. The first available Mode S sensor capable of supporting TIS for your aircraft responds by sending data back through the datalink on every scan of the sensor (approximately every 5 seconds). TIS will be provided by the sensor as long as the aircraft is within coverage range of that sensor. When entering the coverage range of another sensor, TIS will continue provided the next sensor is TIS capable. The transfer of service is automatic. In addition to traffic data, the aircraft receives status messages that advise the pilot when TIS service has been initiated, is continuing, or has been terminated.

While coverage varies with terrain and local site parameters, "line-of-sight" coverage is to be expected within 55 NM of a TIS capable Mode S sensor. Terrain and obstacles can cause areas of no radar coverage.

TIS LIMITATIONS

Traffic may not be displayed for one or more of the following reasons:

1. Radar site is out of service. If a TIS capable Mode S sensor is not in service for any reason, TIS is not available. See Figure 3-11.

2. Your aircraft is beyond maximum range of a TIS capable Mode S site. Maximum range can extend beyond 55 NM up to 100 NM. However, expect TIS service to 55 NM. See Figure 3-11 and 3-12.

Figure 3-11 - TIS Capable Mode S Radar Sensor Sites

Figure 3-12 - TIS Functional Range

3. Your aircraft is inside the "Cone of Silence. When near or above (depending on altitude) the TIS radar site, and out of range of another TIS radar site, TIS data cannot be received. See Figure 3-13.

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4.   The other aircraft is within the "Cone of Silence". So, remember, there may be aircraft within your alert area, but if they are not seen by the radar site they will not show on your display.

5.   Your aircraft is below radar coverage. With no obstructions and flat terrain, the coverage floor is about 2,000-3,000 feet at 60 miles and 4,000-6,000 feet at 100 miles. Terrain and obstacles can substantially decrease coverage range or make coverage asymmetrical about the radar site. See Figure 3-13.

"Cone of Silence"

Mode-S Terminal Secondary Surveillance Radar

Radar Coverage Dead Zones
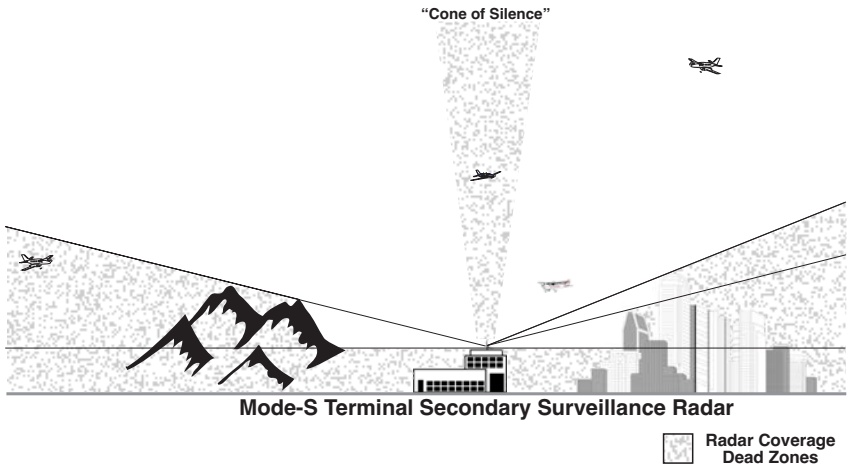
Figure 3-13 - Obstructions To TIS Coverage

6.   The other traffic is below radar coverage. The other aircraft may be in situations mentioned in number 5 and therefore not seen by radar. Again, there may be aircraft within your alert area, but if they are not seen by the radar site they will not show on your display.

7.   The other aircraft is without an operating a Mode A, C or S transponder.

8.   Bearing error increases as the distance from the radar site increases. However, distance and relative altitude will remain accurate.

9.   Due to the way the radar sites check for transponder faults, a reply can be interpreted as two different aircraft. This causes a "self alert". This is shown as a "pop-up" alert intruder at or near the client's position and altitude lasting for only one or two radar scans. It most often occurs during maneuvering or upon entry into TIS coverage.

NOTE: It is important to understand that no display or aural warning of traffic information shows the location of all traffic in the vicinity. Whenever in VMC conditions, continue to visually scan for traffic.

NOTE: Pilots should report TIS outages to Flight Service which will report them to the Airway Facilities Operations Control Centers for resolution, similar to a report of any other system outage.

TIS NORMAL OPERATION

NOTE: TIS availability may be intermittent during turns or other maneuvering where the aircraft structure can block the line of sight between the Mode S radar and the Mode S transponder antenna.

TRFC

To display the TIS traffic page press the **TRFC** Function Select Key.

The following illustration defines the data that appears on the TIS Traffic Display Page:
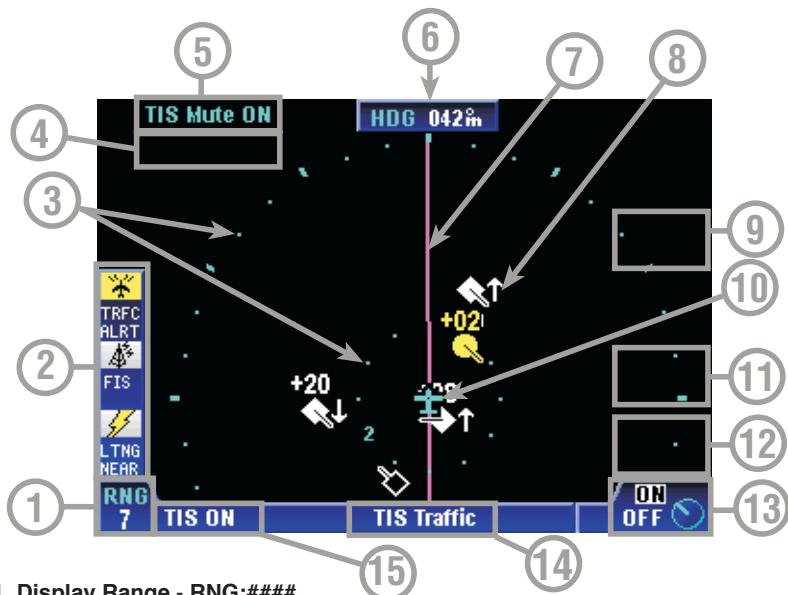
1. **Display Range** - **RNG:####**.
2. **Function Status Icons** - Displays icons representing data available and displayed.
3. **Range Rings** - Outer ring radius is selected range, inner ring radius is always 2 nm.
4. **Current Flight Level** - **FL:###**
5. **Audio Muting** - When audio muting is turned on by pressing the **ENABLE MUTE** Softkey, **TIS Mute ON** will be displayed in this field.
6. **Heading** - Current aircraft magnetic heading (**HDG**) or ground track (**TRK**). If no heading or track information is available, the the field displays **NO HDG/TRK**.
7. **Active Flight Plan**
8. **Traffic Intruder Symbols -** Indicates type of traffic, altitude of traffic, vertical trend of traffic and ground track of traffic.
9. **Flight Level Softkey** - Pressing **FLIGHT LEVEL** toggles the Flight Level display on or off.
10. **Aircraft Symbol** - Indicates present position.
11. **Audio Mute Softkey** - Pressing the **MENU** Key will display the muting softkey. Pressing this softkey will toggle between **DISABLE MUTE** and **ENABLE MUTE**.
12. **Pop-Up Softkey** - Pressing the **MENU** Key will display the pop-up softkey. Pressing this softkey will toggle between **DISABLE POP-UP** and **ENABLE POP-UP**. When enabled, the Traffic Page will be displayed whenever there is a traffic alert.
13. **System ON/OFF** - Rotary Knob selects TIS **ON** or **OFF**.
14. **Page Display Name**
15. **TIS Operating Mode** - Displays **TIS ON**, **TIS OFF** or **TIS FAIL**.

TIS OPERATIONAL CONTROLS
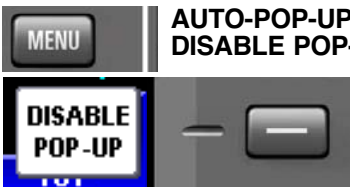
 FLIGHT LEVEL - Pressing the **MENU** Key will display the **FLIGHT LEVEL** Softkey. Pressing this key toggles the altitude tag between relative or absolute altitude as shown in Figures 3-14 and 3-15. When absolute altitude is displayed, the Flight Level will also be displayed in the upper left of the screen. Operation in the absolute mode is limited to 15 seconds.

 AUDIO MUTE - The "TIS Unavailable" audio notification may be muted by pressing the **ENABLE MUTE** Softkey. When enabled TIS Mute ON will be displayed in the upper left of the screen. The **DISABLE MUTE** Softkey will then be available to disable the audio muting. The audio traffic alerts are not affected.

 AUTO-POP-UP - Toggles between **ENABLE POP-UP** and **DISABLE POP-UP**. When enabled the Traffic Display will automatically be displayed in a Traffic Alert situation. In some situations, like high traffic areas or flying in formation, this frequent display changing could be a nuisance. Disabling the pop-up may desirable in these circumstances. This key may be enabled or disabled in system configuration.

 RNG▲/RNG▼ - Advances the indicator to the next range. The upper button increases range, the lower button decreases it. The selected range is displayed in the lower left corner of the display with the inner range ring always 2 nm. The **RNG** button labels will not be displayed when their respective range limits are reached.

 Rotary Knob - Turns the TIS system **On** or **OFF**.

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Traffic Avoidance

Figure 3-14
Relative Altitude Mode
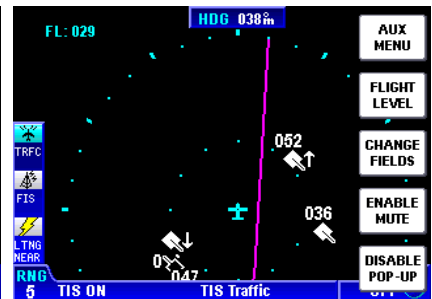
Figure 3-15
Absolute Altitude Mode

TIS SYMBOLOGY

TIS symbols have a track pointer which are not on TCAS/TAS symbols. The track pointer shows the estimated ground track direction the traffic is moving (in 45° increments) relative to your own aircraft.

PROXIMITY INTRUDER TRAFFIC

A filled white diamond indicates that the intruding aircraft has reached the proximity traffic threshold as defined by the TIS system, but is still not considered a threat. This intruder is now 100 feet below your aircraft and flying level. The track pointer on the diamond indicates the direction of the intruder's ground track. Here the intruder is moving approximately 45° to your current track or heading.

PROXIMITY INTRUDER NON-ALTITUDE REPORTING (NAR)TRAFFIC

An open white diamond indicates proximity traffic that is non-altitude reporting. The symbol indicates that the intruder's ground track is approximately 90° to your current track or heading.

TRAFFIC ADVISORY (TA)

A symbol change to a filled yellow circle indicates that the intruding aircraft is considered to be potentially hazardous. Depending on your own altitude the system will display a TA when time to Closest Point of Approach (CPA) is reached as defined by the TIS system. Here the intruder is 100 feet above your aircraft. The arrow indicates the intruder is descending at 500 feet per minute or greater. The intruder is moving at approximately 180° to your current track or heading

TRAFFIC ADVISORY NON-ALTITUDE REPORTING (NAR)
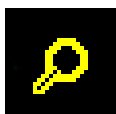
An open yellow circle indicates that the intruding aircraft is considered to be potentially hazardous and is not reporting altitude. Here the intruder is moving at approximately 225° to your current track or heading.

"OFF-SCALE" TRAFFIC

TA traffic that is beyond the selected range will be displayed as half the appropriate symbol at the edge of the display matching the bearing of the traffic.

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Traffic Avoidance

TRAFFIC ADVISORY WHILE IN MAP DISPLAY

If a Traffic Advisory presents itself while in the Map or Weather Display the traffic function icon in the Functions Legend will flash yellow along with **ALERT** as represented in Figure 3-16.
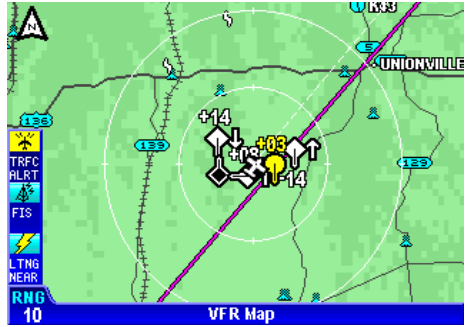
Figure 3-16

AUTO-POP-UP

If AUTO-POP-UP is enabled, a TA will cause the Traffic Display to be presented automatically. The default range of the pop-up display will be 7 nm.

To enable AUTO-POP-UP perform the following:

1. While viewing the Traffic Display, press the **MENU** Key to display the **ENABLE POP-UP** Softkey as shown in Figure 3-17. This Softkey toggles between **ENABLE** and **DIS-ABLE POP-UP**.
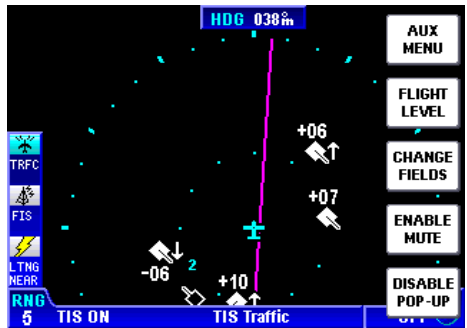
Figure 3-17

VIEWING TRAFFIC IN A DATA FIELD

Traffic may be selected for viewing in a Data Field as shown in Figure 3-18 (also see Section 1 for displaying Data Fields). Altitude tags, vertical trend arrows and ground track pointers will not be shown with traffic symbol in the Data Field display.

Figure 3-18

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Traffic Avoidance

Traffic will not be available in the Data Field if the Map Orientation is set to North Up. It the Map Display is in North Up mode, the Traffic Data Field will appear as shown in Figure 3-19.

Figure 3-19

COAST MODE

When intruders are displayed and TIS information is not received from the terminal Mode S radar for one radar scan, the altitude tag of the intruder is replaced with the text **CST** to inform the pilot that the system is in Coast mode. See Figure 3-20. CST will also be displayed in the Traffic Data Window. This means the displayed intruder information is old and could have changed since the last update.

When two radar scans have elapsed without TIS information, the intruders are removed from the display and **TIS UNAVAILABLE** is displayed in the center of the Traffic Display (Figure 3-21) or **UNAVAIL** will be displayed in the Traffic Data Window. Also, an audible "TIS UNAVAILABLE" notification will be heard (if not muted). The display will revert to normal when TIS information is again available.

Figure 3-20

Figure 3-21

TIS SYSTEM FAULTS

SYSTEM OFF

If the TIS system is set to the OFF position, Figure 3-22 will be displayed.
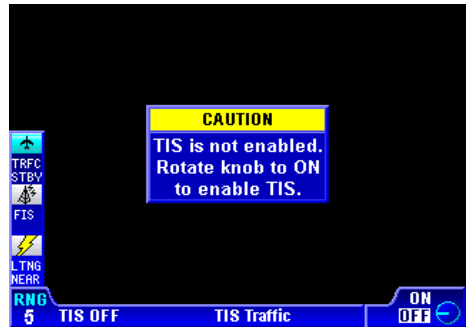
Figure 3-22

NO DATA RECEIVED

If the KMD 250 is not receiving data from the TIS receiver then Figure 3-23 will be displayed. This could indicate that power is not being provided to the TIS receiver (e.g. a pulled breaker), the TIS receiver is turned off, a bad wiring connection between the display and the receiver, or a failed TIS receiver.

Figure 3-23

TRANSPONDER NOT REPORTING ALTITUDE

If the transponder's altitude source has failed or the transponder is put into a non-altitude reporting mode, Figure 3-24 will be displayed.

Figure 3-24

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Traffic Avoidance

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3-18
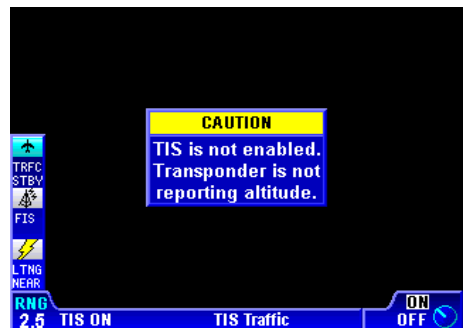
SECTION 4
WX-500 STORMSCOPE® OPERATION

INTRODUCTION

The Bendix/King KMD 250 is capable of being interfaced to an L-3 WX-500 Stormscope® Series II Weather Mapping Sensor. The WX-500 detects electrical discharges associated with thunderstorms within a 200 nm radius of the aircraft. The information is then sent to the KMD 250 and will display the location of the electrical discharges both on the map displays and on a dedicated Stormscope® display.

For a detailed description of the WX-500 and how to interpret the lightning display and a list of error codes, please reference the WX-500 Stormscope® User's Guide.

FUNCTIONAL DESCRIPTION

The antenna detects the electric and magnetic fields generated by intra-cloud, inter-cloud, or cloud-to-ground electrical discharges that occur within a 200 nm radius of the aircraft and sends the resulting "discharge signals" to the processor. The processor digitizes, analyzes, and converts the discharge signals into range and bearing data then stores the data in memory. The WX-500 processor then communicates this information to the KMD 250 as 'strikes' and 'cells'. The WX-500 updates the KMD 250 every two seconds.

STORMSCOPE® FUNCTION STATUS ICONS

The Stormscope® Function Status Icons are located in the lower left of the display. They are used to indicate whether or not the KMD 250 is currently receiving and/or displaying Stormscope® information. The following table shows the various Stormscope® icons and their meanings:

Icon	Colors	Text	Description
	Black on cyan	LTNG <MODE>	Stormscope® information being received and displayed. <MODE> is either STRK (Strike) or CELL depending on mode selected on Stormscope® page.
	Yellow on cyan	LTNG NEAR	Stormscope® information being received and displayed. Strikes have occurred within 25 nm.
	Black on gray.	LTNG	Stormscope® information being received but not displayed.
	Yellow on gray	LTNG NEAR	Stormscope® information being received but not displayed. Strikes have occurred within 25 nm.
	Black on gray with red slash	LTNG FAIL	Stormscope® information not being received / data invalid.

OPERATION

As mentioned earlier, the WX-500 is controlled through the KMD 250. The focus on this section is to provide both background information and a more detailed explanation of the operating procedures. The following text assumes you have both the WX-500 and the KMD 250 switched on and that you have selected the Stormscope® display using the **WX** Function Select Key on the KMD 250.

POWER-UP

At power-up, the WX-500 executes a power-up self test. The self test takes approximately 25 seconds to ensure that all major WX-500 functions are operating properly. During this period you may receive a **NO DATA RECEIVED FROM STORMSCOPE** notification, this is normal. Functions tested include antenna reception, memory and microprocessor functions. An error message is displayed if a fault is detected.

HEADING STABILIZATION

Some aircraft are equipped with a remote heading reference, such as an HSI with a slaved directional gyro. This allows the heading stabilization feature to automatically adjust the position of the discharge points on the display when the aircraft changes heading. The heading information comes from a remote heading source installed in the aircraft that has been connected to the WX-500. If this heading information is valid, the WX-500 and KMD 250 will use it. In the absence of an external heading reference, such as an aircraft with only a directional gyro, or the failure of the heading reference, the KMD 250 will not allow stormscope strikes to be overlaid on the Map Display. When no heading is available it is the responsibility of the user to manually clear strikes after executing a change in heading for reasons discussed in the next section.

CLEAR ALL DISCHARGE POINTS

Clearing the discharge points periodically while monitoring thunderstorms is a good way to determine if the storm is building or dissipating. Discharge points in a building storm will reappear faster and in larger numbers. Discharge points in a dissipating storm will appear slower and in smaller numbers. To clear the discharge points, press the **MENU** Key then press the **CLEAR STRIKES** Softkey.

Clearing the display is especially important if an external heading reference is not used with the system or has failed. The display should be cleared after changes in heading in order to make the displayed strikes reflect their true position in relation to the aircraft.

SWITCH BETWEEN WEATHER VIEWS

When the Stormscope® display is selected the KMD 250 can display strikes in one of two views, either all round (360°) or forward looking only (120°). To switch the display turn the Rotary Knob to toggle between the displays. Figure 4-1 is an example of the all round view and Figure 4-2 shows the forward looking view.
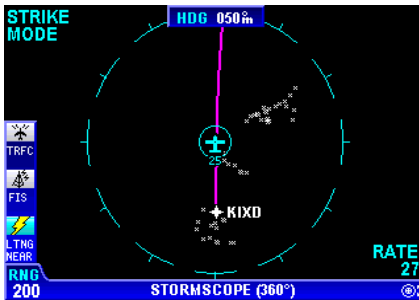
Figure 4-1
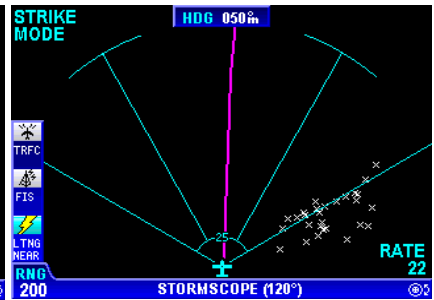
Figure 4-2

SWITCH BETWEEN DISPLAY MODES

The KMD 250 can display the Stormscope® data in one of two modes, either Cell Mode or Strike Mode. To switch the display between modes press the **MENU** Key to display Figure 4-3. Press the **CHANGE MODE** Softkey to toggle between **CELL MODE** and **STRIKE MODE** as shown in Figure 4-4. The mode selected here will remain in effect until you change it, unless the unit is turned off and back on.

Figure 4-3

Cell Display Mode

When viewing the Stormscope® display, if cell display mode is selected, the KMD 250 plots a "+" symbol (discharge point) on the display when it detects associated discharges within the selected range and view (see Figure 4-

Figure 4-4

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Stormscope®

3). The KMD 250 will plot another "+" close to the first for each additional discharge determined to be associated with the group. The KMD 250 will not plot a "+" for any discharge not associated with a group unless it's detected within a 25 nm radius of the aircraft. The effect of this clustering algorithm is to display the location of storm cells instead of individual discharges. The cell display mode is most useful during periods of heavy electrical discharge activity. Using the cell display mode during these periods frees the pilot from sifting through a display full of discharge points to determine exactly where the storm cells are located.

If discharges are detected within 25 nm of the aircraft, the stormscope icon in the Functions Legend will be displayed as that shown here.

Strike Display Mode

If the strike display mode is selected, the KMD 250 immediately plots an "x" symbol (discharge point) on the display for each individual discharge it detects within the selected range and view. The strike display mode plots discharge points on the display in relation to where the discharges are actually detected instead of plotting them close to an associated group of discharge points as is done in the cell display mode. The strike display mode is most useful during periods of light electrical activity because it may plot discharges associated with a building thunderstorm sooner than the cell display mode would.

Again, if discharges are detected within 25 nm of the aircraft, the stormscope icon in the Functions Legend will be displayed as that shown previously.

CHANGING DISPLAY RANGE

To change the displayed range of the Stormscope® display, press the **RNG Δ** or **RNG ∇** keys. With each press of the keys, the display changes to display the electrical discharge activity detected within the new range. The range indicator will also change to display the numerical value of the new range (25, 50, 100, or 200 nm). This new range corresponds to the distance from the aircraft to the outer range ring on the display.

The KMD 250 stores electrical discharge information for all ranges simultaneously to provide an instant, up-to-date display of electrical discharge activity when a new range is selected.

When moving from one range to the next, the 25 nm range is always indicated by the solid inner ring to advise of close proximity to thunderstorms. Also, notice that the discharge points are progressively larger on the shorter ranges and smaller on the longer ranges. This effect makes it easier to spot clusters of discharge points in any range.

OPERATION IN STORMSCOPE® MODE WITH FLIGHT PLAN

If the KMD 250 is receiving Flight Plan information from the GPS and a valid heading input is available, the Flight Plan lines and waypoints will be displayed on the Stormscope® displays.

NOTE: In order to align the lightning strikes correctly to the flight plan lines, heading information is necessary.

OPERATION IN MAP DISPLAY

The majority of the text in this section refers to the Stormscope® displays on the KMD 250. It is also possible however to see thunderstorm cell or strike data while in the Map Display. The Stormscope® overlay must be enabled on Map Setup Page 6.

NOTE: Lightning data will only be displayed on the map if a heading reference is available in the form of an external heading reference input (described previously).

Any settings made while in the Stormscope® displays (i.e. cell/strike mode, clear etc) will be carried over into the Map display. Lightning icons are shown here as they appear on the Map display. The range at which lightning icons are displayed is selectable on Map Setup Page 6.

CAUTION

Because the accuracy of the stormscope sensor is limited, do not rely on the placement of lightning icons for map range settings less than 25 nm.

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4-6

SECTION 5

SYSTEM MESSAGES

VIEWING SYSTEM MESSAGES

A system message is presented as **MESSAGE PRESS MENU** in bold yellow text that flashes alternating with the page title at the bottom of the screen as shown in Figure 5-1.

When the **MENU** Key is pressed, the message will be displayed as in Figure 5-2. In this case the message is a FIS Receiver Failure.

Pressing the **OK** Softkey will exit the Message Page and the yellow **MESSAGE PRESS MENU** prompt will no longer be displayed.

To access the system message again, perform the following steps:

1. Press the **MENU** Key to display the **AUX MENU** Softkey as in Figure 5-3.

Figure 5-1

Figure 5-2
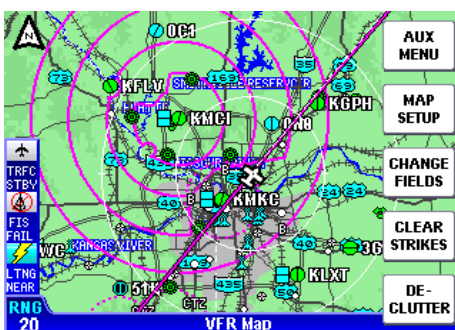
Figure 5-3

2. Press the **AUX MENU** Softkey to display the **AUX-MAIN MENU** Page as shown in Figure 5-4.

3. Use the Joystick to select **Messages** as shown in Figure 5-4.

4. Press the **SELECT** Softkey to display to display the **AUX-MESSAGES** Page as shown in Figure 5-5.

Figure 5-4

Figure 5-5

The following table describes the possible system messages:

Message Text	Description
All User Settings Cleared To Defaults	This message indicates that a problem was detected in the internal memory storage for user preference settings. All settings have been reset to their factory defaults.
Data Card Has Expired Unable To Receive FIS Data (VDL Only)	The data card contains information required for receiving FIS information. The data card has expired and FIS information will no longer be available. Go to www.bendixking.com and order a data card update.
Data Card Update Required For Continued Reception Of FIS Data (VDL Only)	The data card contains information required for receiving FIS information. If the data card is not updated soon, then FIS information will no longer be available. Go to www.bendixking.com and order a data card update.
Duplicate User Waypoint In Flight Plan Data	This message occurs if more than one user waypoint have the same identifier. This usually means that the flight plan and user data file on the datacard have been modified incorrectly. Check the flight plans to make sure the waypoints in them are correct. Edit if necessary.
Error In Flight Plan File	An error has occurred while reading the flight plan data from the datacard. This usually means the flight plan file on the datacard has been modified incorrectly. Check the flight plans to make sure the waypoints in them are correct. Edit if necessary. It message persists after repeated power cycles, replace the datacard.
Error Writing Flight Plan Data To Datacard	An error has occurred when the flight plan data was being stored on the datacard. This may indicate a faulty datacard. If the error persists, replace the datacard.
FIS Data Not Received For More Than 15 Minutes	The KMD 250 has previously received FIS data, but it has been over 15 minutes since the last reception. This is most likely due to the aircraft being at an altitude or location outside of FIS network coverage. See the FIS Network Status Page for locations of FIS transmitters and status.
FIS Decryption Processor Error. FIS Data May Be Unavailable (VDL Only)	The KMD 250 is unable to decrypt the FIS data due to FIS Decryption Processor Error.
FIS Receiver Failure	The KMD 250 is unable to communicate with the KDR 510 VDL Receiver or the KDR 610 XM Receiver. If this message persists, it may indicate a problem with the Receiver or a wiring problem between the KDR 510/610 and KMD 250.
FIS Subscription Database Error. Update Data Card To Receive FIS Data (VDL Only)	This message occurs when an error is detected in the FIS Subscription Data on the datacard. This usually means that the datacard is out of date and needs to be updated in order to receive FIS data.
FIS Subscription Will Expire Soon (VDL Only)	This message occurs when at least one FIS subscription is about to expire. Check the subscription status on the Aux FIS Subscription page. Go to www.bendixking.com to purchase a new subscription.
Flight Plan Waypoint(s) Not Found In Database Have Been Deleted	This message will be displayed if an invalid waypoint is found in a flight plan. This usually means the flight plan file on the datacard has been modified incorrectly. Check the flight plans to make sure the waypoints in them are correct. Edit if necessary.
Inside SUA	This message is displayed when the aircraft is within Special Use Airspace. Alerting must be enabled on Navigation Setup Page.
Internal GPS Failure	This message is displayed if the internal GPS receiver (if so equipped) has failed. Turn the KMD 250 off and then back on. If the message persists, the unit may need service.
Internal Temperature Has Exceeded Limits. Turn Unit Off	This message appears when the KMD 250 unit temperature is too high. Turn the unit off to allow it to cool down. This may indicate that the airflow around the KMD 250 has been blocked.
Invalid User Waypoint In Flight Plan Data	Indicates that an invalid user waypoint is found in a flight plan. This usually means the flight plan file on the datacard has been modified incorrectly. Check flight plans to make sure the waypoints in them are correct. Edit if necessary. If the error persists, replace the datacard.

Section 5
System Messages

Message Text	Description
Nav Data Referenced To True North	This message is displayed when a user-defined magnetic variation of 0 degrees is being used for navigation data. Check Navigation Setup Page.
Nav Data Referenced To User-Defined Mag Var	This message is displayed when a user-defined magnetic variation is being used for navigation data. Check Navigation Setup Page.
No Valid FIS Subscriptions	This message occurs when no current FIS subscriptions are available. FIS data will be unavailable. Check the subscription status on the Aux Menu FIS Subscription page. Go to www.bendixking.com to purchase a new VDL subscription. Go to www.xmradio.com/weather to purchase a new XM subscription. This is the only indication received when an XM subscription has expired.
Regulated 12V Out Of Range. Switch Unit Off	The internal 12V power supply is operating outside its acceptable range. Turn the unit off and back on. If the message persists then the unit may need service.
Regulated 5V Out Of Range. Switch Unit Off	The internal 5V power supply is operating outside its acceptable range. Turn the unit off and back on. If the message persists then the unit may need service.
Regulated 3.3V Out Of Range. Switch Unit Off	The internal 3.3V power supply is operating outside its acceptable range. Turn the unit off and back on. If the message persists then the unit may need service.
Regulated 3V Out Of Range. Switch Unit Off	The internal 3V power supply is operating outside its acceptable range. Turn the unit off and back on. If the message persists then the unit may need service.
Stormscope Failure	The KMD 250 is unable to communicate with the Stormscope® or it has reported a failure. See the Stormscope® page for error codes and the Stormscope® users manual for more information.
Traffic System Failure	The KMD 250 is unable to communicate with the traffic system or the traffic system has reported a failure.
Unit Configuration Cleared To Defaults	A problem was detected in the memory used for storing the unit configuration settings. The settings have been set back to factory defaults. In most cases the unit will need to be reconfigured by an authorized Bendix/King installer in order to operate properly.
Unit History Data Cleared To Defaults	A problem was detected in the memory used to store unit history information. The memory has effect on operation, it simply means less information will be available to the service center if the unit requires service.

APPENDIX A

DEFINITIONS, ACRONYMS AND ABBREVIATIONS

DEFINITIONS

Alphabetic: any of the following characters (b/ is a space): b/ABCDE-FGHIJKLMNOPQRSTUVWXYZ

Alphanumeric: any of the following characters (b/ is a space): b/ABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789

Automatic Leg Sequencing: As a waypoint is reached in the flight plan, the next leg and waypoint of the flight plan automatically becomes active.

Baud: bits per sec

Barometric Altitude: pressure altitude corrected for barometric altimeter setting

Bearing To User Waypoint (BRG): bearing from the present position to the active user waypoint measured clockwise relative to true or magnetic north (true is implied unless magnetic is specified)

Cross Track Error: distance from the present position to the nearest point on the desired course, and the direction (right or left) from the desired course to the present position

Cursor Field: a character position or group of adjacent character positions on which a cursor can appear

Data Field: a character position or group of adjacent character positions which display a single data item; a data field may be a single character cursor field, or may contain multiple characters.

Data List: an ordered list of data elements which a given cursor field can accept

Desired Track (DTK): The angle that the desired flight path makes with respect to true north at the point nearest the present position. Magnetic desired track uses the local magnetic variation.

Distance To Waypoint (DIS): distance from the present position to the active waypoint

Ground Speed: absolute value of the rate of change of position

Headwind: difference between true airspeed and ground speed when true airspeed is more than ground speed

Knots: Nautical Miles/hr

Leg Mode: navigation of a route by picking the most direct route between waypoints along the route.

OBS Course Mode: selecting a course to a waypoint based on setting a specific bearing "to" or "from" the waypoint.

Special Use Airspace (SUA): any of the following: prohibited area, restricted area, warning area, alert area, MOA, Class A through G, unknown, danger, caution, training, CTA, or TMA type.

Tailwind: difference between ground speed and true airspeed when ground speed is more than true airspeed.

Track (TRK): angle of the aircraft's path over the ground measured clockwise relative to north.

ACRONYMS AND ABBREVIATIONS

AAS: Aeronautical Advisory Service

ACT: Active (user waypoint or flight plan)

ADF: Automatic Direction Finder

AFIS: Aerodrome Flight Information Service

AGL: Above Ground Level

ALT: Altitude

AMR: Americas data area

ANSI: American National Standards Institute

APR: Approach

APT: Airport

ARTCC: Air Route Traffic Control Center

ARVL: Arrival

ASOS: Automated Surface Observation System

ATC: Air Traffic Control

ATF: Aerodrome Traffic Frequency

ATI: Atlantic International data area

ATIS: Automatic Terminal Information Service

AWOS: Automated Weather Observing System

A/C: Aircraft

BRG: Bearing

CAA:	Civil Aviation Authority
CAS:	Calibrated Airspeed
CL B:	Class B Airspace
CL C:	Class C Airspace
CLR:	Clearance Delivery
com:	communication
CDI:	Course Deviation Indicator
CTA:	Control Area
CTAF:	Common Traffic Advisory Frequency
CTR:	Control Zone or Center
dB:	decibels
DEP:	Departure
DIR:	Director (approach control/radar)
DIS:	Distance
Dgr:	Danger
DME:	Distance Measuring Equipment
DOT:	United States Department of Transportation
DTK:	Desired Track
EFIS:	Electronic Flight Instrument System
ESA:	Enroute Safe Altitude
ETA:	Estimated Time of Arrival
ETE:	Estimated Time Enroute
FAA:	Federal Aviation Administration
FAR:	Federal Aviation Regulations
FIR:	Flight Information Region
FIS:	Flight Information Services
FIS-B:	Flight Information Services - Broadcast
FLT:	Flight
FPL:	Flight Plan
FPM:	Feet Per Minute
FSS:	Flight Service Station
FT:	Feet

GCO:	Ground Communications Outlet
GPS:	Global Positioning System
GND:	Ground
GRND:	Ground
hr:	hour
HSI:	Horizontal Situation Indicator
IFR:	Instrument Flight Rules
IGS:	Instrument Guidance System (used outside U.S. only)
ILS:	Instrument Landing System
in.:	inches
INT:	Intersection
Kt.:	Knots
LAT:	Latitude
LB:	Pounds
LBC:	Localizer Back Course
LDA:	Localizer Type Directional Aid Approach
LOC:	Localizer Approach
LON:	Longitude
m:	meters
MATZ:	Military Air Traffic Zone (used outside the U.S. only)
mB:	millibars
MCOM:	Multicom
MF:	Mandatory Frequency
mi:	statute miles
min:	minutes
MLS:	Microwave Landing System
MOA:	Military Operation Area
MSA:	Minimum Safe Altitude
MSL:	Mean Sea Level
msec:	milliseconds
NDB:	Non-Directional Beacon

NM:	Nautical Miles
NO APR:	No Approach
NPA:	Non-Precision Approach
NP APR:	Non-Precision Approach
NVM:	Non Volatile Memory
OBI:	Omni-directional Bearing Indicator
OBS:	Omni-directional Bearing Selector
Obs:	Obstacle
OSGB:	Ordnance Survey of Great Britain
PAI:	Pacific International data area
PETE:	Pointer ETE
Phb:	Prohibited (Airspace)
PPOS:	Present Position
PTAX:	Pre-Taxi Clearance
RAD:	Radial
RDO:	Radio
RDR:	Radar-Only Frequency
REF:	Reference
Res:	Restricted (Airspace)
RMI:	Radio Magnetic Indicator
SDF:	Simplified Directional Facility Approach
sec:	seconds
SPD:	Speed
SUA:	Special Use Airspace
TKE:	Track Angle Error
TMA:	Terminal Area
TOPO:	Topographical Data (i.e. coastlines, terrain, rivers, lakes etc)
TRFC:	Traffic
TRK:	Actual Track
TRSA:	Terminal Radar Service Area
TWR:	Tower

Definitions, Acronyms & Abbreviations

UIR: Upper Information Region

UNIC: Unicom

UNS: Unspecified

UTC: Universal Coordinated Time (same as Greenwich Mean Time)

UTM: Universal Transverse Mercator

V: Volts

VDL: VHF Data Link

VHF: Very High Frequency

VOR: Very High Frequency Omni-directional Radio Range

VRP: Visual Reference Point

WPT: Waypoint

XM: XM Satellite Weather

XTK: Cross Track Error

°C: degrees Celsius

°F: degrees Fahrenheit

APPENDIX B
COMMON WEATHER ABBREVIATIONS

ABNDT	Abundant	AFCTG	Affecting
ABNML	Abnormal	AFDK	After dark
ABT	About	AFOS	Automated Field Operations System
ABV	Above		
AC	Convective outlook or altocumulus	AFSS	Automated Flight Service Station
ACC	Altocumulus castel-lanus clouds	AFT	After
		AFTN	Afternoon
ACCAS	Altocumulus castel-lanus clouds	AGL	Above ground level
		AGN	Again
ACFT MSHP	Aircraft Mishap	AGRD	Agreed
ACCUM	Accumulate	AGRS	Agrees
ACFT	Aircraft	AGRMT	Agreement
ACLT	Accelerate	AHD	Ahead
ACLTD	Accelerated	AIRMET	Airman's Meteoro-logical Information
ACLTG	Accelerating		
ACLTS	Accelerates	AK	Alaska
ACPY	Accompany	AL	Alabama
ACRS	Across	ALF	Aloft
ACSL	Altocumulus standing lenticular	ALG	Along
		ALGHNY	Allegheny
ACTV	Active	ALP	Airport Location Point
ACTVTY	Activity		
ACYC	Anticyclone	ALQDS	All quadrants
ADJ	Adjacent	ALSTG	Altimeter setting
ADL	Additional	ALT	Altitude
ADQT	Adequate	ALTA	Alberta
ADQTLY	Adequately	ALTHO	Although
ADRNDCK	Adirondack	ALTM	Altimeter
ADVCT	Advect	ALUTN	Aleutian
ADVCTD	Advected	AMD	Amend
ADVCTG	Advecting	AMDD	Amended
ADVCTN	Advection	AMDG	Amending
ADVCTS	Advects	AMDT	Amendment
ADVN	Advance	AMP	Amplify
ADVNG	Advancing	AMPG	Amplifying
ADVY	Advisory	AMPLTD	Amplitude
ADVYS	Advisories	AMS	Air mass
AFCT	Affect	AMT	Amount
AFCTD	Affected	ANLYS	Analysis

Appendix B
Wx Abbreviations

Common Weather Abbreviations

ANS	Answer	AWIPS	Advanced Interactive Weather Processing System
AO1	Automated Reporting Station		
AO2	Automated Reporting Station	AWOS	Automated Weather Observing system
AOA	At or above	AWT	Awaiting
AOB	At or below	AWW	Alert Weather Watch
AP	Anomalous Propagation	AZ	Arizona
		AZM	Azimuth
APCH	Approach	B	Began
APCHG	Approaching	BACLIN	Baroclinic
APCHS	Approaches	BAJA	Baja, California
APLCN	Appalachian	BATROP	Barotropic
APLCNS	Appalachians	BC	British Columbia or patches (descriptor used with FG)
APPR	Appear		
APPRG	Appearing		
APPRS	Appears	BCFG	Patchy fog
APRNT	Apparent	BCH	Beach
APRNTLY	Apparently	BCKG	Backing
APRX	Approximate	BCM	Become
APRXLY	Approximately	BCMG	Becoming
AR	Arkansas	BCMS	Becomes
ARL	Air Resources Lab	BD	Blowing dust
ARND	Around	BDA	Bermuda
ARPT	Airport	BDRY	Boundary
ASAP	As soon as possible	BECMG	Becoming
ASL	Above Sea Level	BFDK	Before dark
ASMD	As Amended	BFR	Before
ASOS	Automated Surface Observing System	BGN	Begin
		BGNG	Beginning
ASSOCD	Associated	BGNS	Begins
ASSOCN	Association	BHND	Behind
ATCT	Air Traffic Control Tower	BINOVC	Breaks in overcast
		BKN	Broken
ATLC	Atlantic	BL	Blowing
ATTM	At this time	BLD	Build
ATTN	Attention	BLDG	Building
AUTO	Automated report	BLDS	Builds
AVBL	Available	BLDUP	Buildup
AVG	Average	BLKHLS	Black Hills
AVN	Aviation model	BLKT	Blanket
AWC	Aviation Weather Center	BLKTG	Blanketing

BLKTS	Blankets	CAT	Clear air turbulence
BLO	Below or below clouds	CAVOK	Ceiling and visibility OK
BLW	Below	CAVU	Ceiling and visibility unlimited
BLZD	Blizzard		
BN	Blowing sand	CB	Cumulonimbus
BND	Bound	CBMAM	Cumulonimbus Mammatus clouds
BNDRY	Boundary		
BNDRYS	Boundaries	CC	Cirrocumulus
BNTH	Beneath	CCCC	Generic WMO format code group for a four-letter location identifier
BOOTHEEL	Bootheel		
BR	Branch or mist (METAR, used only for visibility between 5/8 and 6 miles)		
		CCL	Convective conden-sation level
BRF	Brief	CCLDS	Clear of clouds
BRG	Branching	CCLKWS	Counterclockwise
BRK	Break	CCSL	Cirrocumulus standing lenticular
BRKG	Breaking		
BRKHIC	Breaks in higher clouds	CCx	Code used in the WMO abbreviated heading to indicate a corrected forecast, where x is the letter A through X
BRKS	Breaks		
BRKSHR	Berkshire		
BRKSHRS	Berkshires		
BRM	Barometer		
BRN	Bulk Richardson Number	CDFNT	Cold front
		CDFNTL	Cold frontal
BRS	Branches	CFP	Cold front passage
BS	Blowing snow	CG	Cloud to ground (lightning)
BTWN	Between		
BWER	Bounded weak echo region	CHC	Chance
		CHCS	Chances
BYD	Beyond	CHG	Change
C	Celsius	CHGD	Changed
CA	California or cloud-to-air lightning in PIREPs	CHGG	Changing
		CHGS	Changes
		CHI	Cloud-Height indicator
CAA	Cold air advection	CHINO	Sky condition at secondary location not available
CAPE	Convective available potential energy		
CARIB	Caribbean	CHOP	Turbulence type characterized by rapid, rhythmic jolts
CAS	Committee for Aviation Services		
CASCDS	Cascades	CI	Cirrus

Common Weather Abbreviations

CIG	Ceiling	CONT	Continue
CIGS	Ceilings	CONTD	Continued
CIN	Convective inhibition	CONTLY	Continually
CLD	Cloud	CONTG	Continuing
CLDNS	Cloudiness	CONTRAILS	Condensation trails
CLDS	Clouds	CONTS	Continues
CLKWS	Clockwise	CONTDVD	Continental Divide
CLR	Clear	CONUS	Continental U.S.
CLRG	Clearing	COORD	Coordinate
CLRS	Clears	COR	Correction
CMPLX	Complex	CPBL	Capable
CNCL	Cancel	CPC	Climate Prediction Center
CNCLD	Canceled		
CNCLG	Canceling	CRC	Circle
CNCLS	Cancels	CRCLC	Circulate
CNDN	Canadian	CRCLN	Circulation
CNTR	Center	CRLC	Circulate
CNTRD	Centered	CRLN	Circulation
CNTRLN	Centerline	CRNR	Corner
CNTRS	Centers	CRNRS	Corners
CNTRL	Central	CRS	Course
CNTY	County	CS	Cirrostratus
CNTYS	Counties	CSDR	Consider
CNVG	Converge	CSDRBL	Considerable
CNVGG	Converging	CST	Coast
CNVGNC	Convergence	CSTL	Coastal
CNVTN	Convection	CT	Connecticut
CNVTV	Convective	CTC	Contact
CNVTVLY	Convectively	CTGY	Category
CONFDC	Confidence	CTSKLS	Catskills
CO	Colorado	CU	Cumulus
COMPAR	Compare	CUFRA	Cumulus fractus
COMPARG	Comparing	CVR	Cover
COMPARD	Compared	CVRD	Covered
COMPARS	Compares	CVRG	Covering
COMPR	Compare	CVRS	Covers
COMPRG	Comparing	CWSU	Center Weather Service Units
COMPRD	Compared		
COMPRS	Compares	CYC	Cyclonic
COND	Condition	CYCLGN	Cyclogenesis
CONS	Continuous	DABRK	Daybreak

DALGT	Daylight	DMSHD	Diminished
DBL	Double	DMSHG	Diminishing
DC	District of Columbia	DMSHS	Diminishes
DCR	Decrease	DNDFTS	Downdrafts
DCRD	Decreased	DNS	Dense
DCRG	Decreasing	DNSLP	Downslope
DCRGLY	Decreasingly	DNSTRM	Downstream
DCRS	Decreases	DNWND	Downwind
DE	Delaware	DP	Deep
DEG	Degree	DPND	Deepened
DEGS	Degrees	DPNG	Deepening
DELMARVA	Delaware-Maryland-Virginia	DPNS	Deepens
		DPR	Deeper
DFCLT	Difficult	DPTH	Depth
DFCLTY	Difficulty	DR	Low Drifting (descriptor used with DU, SA or SN
DFNT	Definite		
DFNTLY	Definitely		
DFRS	Differs	DRDU	Drifting dust
DFUS	Diffuse	DRFT	Drift
DGNL	Diagonal	DRFTD	Drifted
DGNLLY	Diagonally	DRFTG	Drifting
DIGG	Digging	DRFTS	Drifts
DIR	Direction	DRSA	Low drifting sand
DISC	Discontinue	DRSN	Low drifting snow
DISCD	Discontinued	DRZL	Drizzle
DISCG	Discontinuing	DS	Duststorm
DISRE	Disregard	DSCNT	Descent
DISRED	Disregarded	DSIPT	Dissipate
DISREG	Disregarding	DSIPTD	Dissipated
DKTS	Dakotas	DSIPTG	Dissipating
DLA	Delay	DSIPTN	Dissipation
DLAD	Delayed	DSIPTS	Dissipates
DLT	Delete	DSND	Descend
DLTD	Deleted	DSNDG	Descending
DLTG	Deleting	DSNDS	Descends
DLY	Daily	DSNT	Distant
DMG	Damage	DSTBLZ	Destabilize
DMGD	Damaged	DSTBLZD	Destabilized
DMGG	Damaging	DSTBLZG	Destabilizing
DMNT	Dominant	DSTBLZS	Destabilizes
DMSH	Diminish	DSTBLZN	Destabilization

Common Weather Abbreviations

DSTC	Distance	ENELY	East-northeasterly
DTRT	Deteriorate	ENERN	East-northeastern
DTRTD	Deteriorated	ENEWD	East-northeastward
DTRTG	Deteriorating	ENHNC	Enhance
DTRTS	Deteriorates	ENHNCD	Enhanced
DU	Widespread dust storm	ENHNCG	Enhancing
		ENHNCS	Enhances
DURC	During climb	ENHNCMNT	Enhancement
DURD	During descent	ENRT	Enroute
DURG	During	ENTR	Entire
DURGC	During climb	ERN	Eastern
DURGD	During descent	ERY	Early
DURN	Duration	ERYR	Earlier
DVLP	Develop	ESE	East-southeast
DVLPD	Developed	ESELY	East-southeasterly
DVLPG	Developing	ESERN	East-southeastern
DVLPMT	Development	ESEWD	East-southeastward
DVLPS	Develops	ESNTL	Essential
DVRG	Diverge	ESTAB	Establish
DVRGG	Diverging	EST	Estimate
DVRGNC	Divergence	ESTS	Estimates
DVRGS	Diverges	ETA	Estimated time of arrival or ETA model
DVV	Downward vertical velocity		
DWNDFTS	Downdrafts	ETC	Et cetera
DWPNT	Dew point	ETIM	Elapsed time
DWPNTS	Dew points	EVE	Evening
DX	Duplex	EWD	Eastward
DZ	Drizzle (METAR)	EXCLV	Exclusive
E	East	EXCLVLY	Exclusively
EBND	Eastbound	EXCP	Except
EFCT	Effect	EXPC	Expect
ELNGT	Elongate	EXPCD	Expected
ELNGTD	Elongated	EXPCG	Expecting
ELSW	Elsewhere	EXTD	Extend
EMBD	Embedded	EXTDD	Extended
EMBDD	Embedded	EXTDG	Extending
EMERG	Emergency	EXTDS	Extends
ENCTR	Encounter	EXTN	Extension
ENDG	Ending	EXTRAP	Extrapolate
ENE	East-northeast	EXTRAPD	Extrapolated

EXTRM	Extreme		FLWG	Following
EXTRMLY	Extremely		FM	From
EXTSV	Extensive		FMGGgg	From the time (UTC) indicated by GGgg. Generic WMO format code group, indicating a significant and rapid (in less than 1 hour) change to a new set of prevailing conditions
F	Fahrenheit			
FA	Aviation area forecast			
FAH	Fahrenheit			
FAM	Familiar			
FC	Funnel cloud (+FC = Tornado or water spout)			
FCST	Forecast		FMT	Format
FCSTD	Forecasted		FNCTN	Function
FCSTG	Forecasting		FNT	Front
FCSTR	Forecaster		FNTL	Frontal
FCSTS	Forecasts		FNTS	Fronts
FEW	Few (used to describe cloud cover or weather phenomena, >0 octas to 2 octas cloud amount)		FNTGNS	Frontogenesis
			FNTLYS	Frontolysis
			FORNN	Forenoon
			FPM	Feet per minute
			FQT	Frequent
			FQTLY	Frequently
FG	Fog (METAR, only when visibility is less than 5/8 mile)		FRM	Form
			FRMG	Forming
FIBI	Filed but impracticable to transmit		FRMN	Formation
			FROPA	Frontal passage
FIG	Figure		FROSFC	Frontal surface
FILG	Filling		FRQ	Frequent
FIR	Flight information region		FRST	Frost
			FRWF	Forecast wind factor
FIRAV	First available		FRZ	Freeze
FIS	Flight Information Service		FRZLVL	Freezing level
			FRZN	Frozen
FIS-B	Flight Information Service - Broadcast		FRZG	Freezing
FIRST	First observation after a break in coverage at manual station		FT	Feet or Terminal Forecast
			FTHR	Further
			FU	Smoke
FL	Florida or flight level		FV	Flight visibility
FLG	Falling		FVRBL	Favorable
FLRY	Flurry		FWD	Forward
FLRYS	Flurries		FYI	For your information
FLT	Flight		FZ	Freezing
FLW	Follow			

Common Weather Abbreviations

FZRANO	Freezing rain sensor not available	HDSVLY	Hudson Valley
		HDWND	Head wind
G	Gust	HGT	Height
GA	Georgia	HI	High or Hawaii
GEN	General	HIER	Higher
GENLY	Generally	HIFOR	High level forecast
GEO	Geographic	HLF	Half
GEOREF	Geographical reference	HLTP	Hilltop
		HLSTO	Hailstones
GF	Fog	HLYR	Haze layer
GICG	Glaze icing	HND	Hundred
GLFALSK	Gulf of Alaska	HPC	Hydrometeorological Prediction Center
GLFCAL	Gulf of California		
GLFMEX	Gulf of Mexico	HR	Hour
GLFSTLAWR	Gulf of St. Lawrence	HRS	Hours
		HRZN	Horizon
GND	Ground	HTG	Heating
GNDFG	Ground fog	HURCN	Hurricane
GOES	Geostationary Operational Environmental Satellite	HUREP	Hurricane report
		HV	Have
		HVY	Heavy
GR	Hail (greater than 1/4 inch in diameter)	HVYR	Heavier
		HVYST	Heaviest
		HWVR	However
GRAD	Gradient	HWY	Highway
GRDL	Gradual	HZ	Haze
GRDLY	Gradually	IA	Iowa
GRT	Great	IC	Ice crystals or ice
GRTLY	Greatly	ICAO	International Civil Aviation Organization
GRTR	Greater		
GRTST	Greatest		
GRTLKS	Great Lakes	ICG	Icing
GS	Small hail or snow pellets (smaller than 1/4 inch in diameter)	ICGIC	Icing in clouds
		ICGICIP	Icing in clouds and in precipitation
		ICGIP	Icing in precipitation
GSTS	Gusts	ID	Idaho
GSTY	Gusty	IFR	Instrument flight rules
GTS	Global Telecommunication System		
		IL	Illinois
GV	Ground visibility	IMC	Instrument meteorolgical conditions
HAZ	Hazard		
HCVIS	High clouds visible		
HDFRZ	Hard freeze	IMDT	Immediate

IMDTLY	Immediately
IMPL	Impulse
IMPLS	Impulses
IMPT	Important
INCL	Include
INCLD	Included
INCLG	Including
INCLS	Includes
INCR	Increase
INCRD	Increased
INCRG	Increasing
INCRGLY	Increasingly
INCRS	Increases
INDC	Indicate
INDCD	Indicated
INDCG	Indicating
INDCS	Indicates
INDEF	Indefinite
INFO	Information
INLD	Inland
INSTBY	Instability
INTCNTL	Intercontinental
INTER	Intermittent
INTL	International
INTMD	Intermediate
INTMT	Intermittent
INTMTLY	Intermittently
INTR	Interior
INTRMTRGN	Intermountain region
INTS	Intense
INTSFCN	Intensification
INTSFY	Intensify
INTSFYD	Intensified
INTSFYG	Intensifying
INTSFYS	Intensifies
INTSTY	Intensity
INTVL	Interval
INVRN	Inversion
IOVC	In overcast
INVOF	In vicinity of

IP	Ice pellets
IPV	Improve
IPVG	Improving
IR	Infrared
ISOL	Isolate
ISOLD	Isolated
JCTN	Junction
JTSTR	Jet stream
KFRST	Killing frost
KLYR	Smoke layer aloft
KOCTY	Smoke over city
KS	Kansas
KT	Knots
KY	Kentucky
L	Left
LA	Louisiana
LABRDR	Labrador
LAPS	Local Analysis and Prediction System
LAMP	Local AWIPS MOS Program
LAST	Last observation before a break in coverage at a manual station
LAT	Latitude
LAWRS	Limited aviation weather reporting station
LCL	Local or Lifted condensation level
LCLY	Locally
LCTD	Located
LCTN	Location
LCTMP	Little change in temperature
LDG	Landing
LEVEL	Level
LFM	Limited fine mesh model
LFTG	Lifting
LGRNG	Long-range
LGT	Light
LGTR	Lighter

Common Weather Abbreviations

LGWV	Long wave	LTST	Latest
LI	Lifted Index	LV	Leaving
LIFR	Low instrument flight rules	LVL	Level
		LVLS	Levels
LIS	Lifted Indices	LWR	Lower
LK	Lake	LWRD	Lowered
LKS	Lakes	LWRG	Lowering
LKLY	Likely	LYR	Layer
LLJ	Low level jet	LYRD	Layered
LLWAS	Low-level wind shear alert system	LYRS	Layers
		M	Minus or Less than lowest sensor value
LLWS	Low-level wind shear		
LMTD	Limited	MA	Massachusetts
LMTG	Limiting	MAN	Manitoba
LMTS	Limits	MAX	Maximum
LN	Line	MB	Millibars
LNS	LInes	MCD	Mesoscale discussion
LO	Low		
LONG	Longitude	MD	Maryland
LONGL	Longitudinal	MDFY	Modify
LRG	Large	MDFYD	Modified
LRGLY	Largely	MDFYG	Modifying
LRGR	Larger	MDL	Model
LRGST	Largest	MDLS	Models
LST	Local standard time	MDT	Moderate
LTD	Limited	MDTLY	Moderately
LTG	Lightning	ME	Maine
LTGCA	Lightning cloud-to-air	MED	Medium
		MEGG	Merging
LTGCC	Lightning cloud-to-cloud	MESO	Mesoscale
		MET	Meteorological
LTGCG	Lightning cloud-to-ground	METAR	Aviation Routine Weather Report
		METRO	Metropolitan
LTGCCCG	Lightning cloud-to-cloud cloud-to-ground	MEX	Mexico
		MHKVLY	Mohawk Valley
LTGCW	Lightning cloud-to-water	MI	Michigan , shallow, or mile
LTGIC	Lightning in cloud	MID	Middle
LTL	Little	MIDN	Midnight
LTLCG	Little change	MIL	Military
LTR	Later	MIN	Minimum

MIFG	Shallow fog	NAB	Not above
MISG	Missing	NAT	North Atlantic
MLTLVL	Melting level	NATL	National
MN	Minnesota	NAV	Navigation
MNLD	Mainland	NAVAID	Electronic navigation aid facility (limited to VOR or VORTAC for PIREPs)
MNLY	Mainly		
MO	Missouri		
MOD	Moderate		
MOGR	Moderate or greater		
MOS	Model Output Statistics		
		NB	New Brunswick
MOV	Move	NBND	Northbound
MOVD	Moved	NBRHD	Neighborhood
MOVG	Moving	NC	North Carolina
MOVMT	Movement	NCDC	National Climatic Data Center
MOVS	Moves		
MPH	Miles per hour	NCEP	National Center of Environmental Prediction
MRGL	Marginal		
MRGLLY	Marginally		
MRNG	Morning	NCO	NCEP Central Operations
MRTM	Maritime		
MS	Mississippi	NCWX	No change in weather
MSG	Message		
MSL	Mean sea level	ND	North Dakota
MST	Most	NE	Northeast
MSTLY	Mostly	NEB	Nebraska
MSTR	Moisture	NEC	Necessary
MT	Montana	NEG	Negative
MTN	Mountain	NEGLY	Negatively
MTNS	Mountains	NELY	Northeasterly
MULT	Multiple	NERN	Northeastern
MULTILVL	Multilevel	NEWD	Northeastward
MVFR	Marginal visual flight rules	NEW ENG	New England
		NFLD	Newfoundland
MWO	Meteorological Watch Office	NGM	Nested grid model
		NGT	Night
MX	Mixed (characterized as a combination of clear and rime ice	NH	New Hampshire
		NHC	National Hurricane Center
		NIL	None
		NJ	New Jersey
MXD	Mixed	NL	No layers
N	North	NLT	Not later than
N/A	Not applicable	NLY	Northerly
		NM	New Mexico

Common Weather Abbreviations

NMBR	Number	NWS	National Weather Service
NMBRS	Numbers	NY	New York
NMC	National Meteorological Center	NXT	Next
		OAT	Outside air temperature
NML	Normal	OBND	Outbound
NMRS	Numerous	OBS	Observation
NNE	North-northeast	OBSC	Obscure
NNELY	North-northeasterly	OBSCD	Obscured
NNERN	North-northeastern	OBSCG	Obscuring
NNEWD	North-northeast-ward	OCFNT	Occluded front
NNW	North-northwest	OCLD	Occlude
NNWLY	North-northwesterly	OCLDS	Occludes
NNWRN	North-northwestern	OCLDD	Occluded
NNWWD	North-northwest-ward	OCLDG	Occluding
		OCLN	Occlusion
NNNN	End of message	OCNL	Occasional
NOAA	National Oceanic and Atmospheric Administration	OCNLY	Occasionally
		OCR	Occur
NOPAC	Northern Pacific	OCRD	Occurred
NOS	National Ocean Service	OCRG	Occurring
		OCRS	Occurs
NOSPECI	No SPECI reports are taken at station	OFC	Office
		OFCM	Office of the Federal Coordinator for Meteorology
NPRS	Nonpersistent		
NR	Near		
NRLY	Nearly	OFP	Occluded frontal passage
NRN	Northern		
NRW	Narrow	OFSHR	Offshore
NS	Nova Scotia	OH	Ohio
NSC	No significant cloud	OHD	Overhead
NSW	No significant weather	OK	Oklahoma
		OMTNS	Over mountains
NTFY	Notify	ONSHR	On shore
NTFYD	Notified	OR	Oregon
NV	Nevada	ORGPHC	Orographic
NVA	Negative vorticity advection	ORIG	Original
		OSV	Ocean station vessel
NW	Northwest		
NWD	Northward	OTLK	Outlook
NWLY	Northwesterly	OTP	On top
NWRN	Northwestern	OTR	Other

OTRW	Otherwise	PNO	Precipitation amount not available
OUTFLO	Outflow		
OV	Over	PO	Dust/ sand swirls
OVC	Overcast	POS	Positive
OVHD	Overhead	POSLY	Positively
OVNGT	Overnight	PPINA	Radar weather report not available
OVR	Over	PPINE	Radar weather report no echoes observed
OVRN	Overrun		
OVRNG	Overrunning		
OVTK	Overtake	PPSN	Present position
OVTKG	Overtaking	PR	Partial
OVTKS	Overtakes	PRBL	Probable
P	Higher than greatest sensor value	PRBLY	Probably
		PRBLTY	Probability
P6SM	Visibility forecast to be greater than 6 statute miles	PRECD	Precede
		PRECDD	Preceded
		PRECDG	Preceding
PA	Pennsylvania	PRECDS	Precedes
PAC	Pacific	PRES	Pressure
PATWAS	Pilot's automatic telephone weather answering service	PRESFR	Pressure falling rapidly
		PRESRR	Pressure rising rapidly
PBL	Planetary boundary layer	PRFG	Partial fog
PCPN	Precipitation	PRIM	Primary
PD	Period	PRIN	Principal
PDS	Periods	PRIND	Present indications are...
PDMT	Predominant		
PE	Ice pellets	PRJMP	Pressure jump
PEN	Peninsula	PROB	Probability
PERM	Permanent	PROBC C	Forecaster's assessment of the probability of occurrence of a thunderstorm or precipitation event, along with associated weather elements (wind, visibility, and/or sky condition) whose occurrences are directly related to, and contemporaneous with, the thunderstorm or precipitation event
PGTSND	Puget Sound		
PHYS	Physical		
PIBAL	Pilot balloon observation		
PIREP	Pilot weather report		
PK WND	Peak wind		
PL	Ice pellets		
PLNS	Plains		
PLS	Please		
PLTO	Plateau		
PM	Postmeridian		
PNHDL	Panhandle		

Common Weather Abbreviations

PROC	Procedure	PY	Spray
PROD	Produce	QN	Question
PRODG	Producing	QPFERD	NCEP excessive rainfall discussion
PROG	Forecast		
PROGD	Forecasted	QPFHSD	NCEP heavy snow discussion
PROGS	Forecasts		
PRSNT	Present	QPFSPD	NCEP special precipitation discussion
PRSNTLY	Presently		
PRST	Persist		
PRSTS	Persists	QSTNRY	Quasistationary
PRSTNC	Persistence	QTR	Quarter
PRSTNT	Persistent	QUAD	Quadrant
PRVD	Provide	QUE	Quebec
PRVDD	Provided	R	Right (with reference to runway designation) or rain
PRVDG	Providing		
PRVDS	Provides		
PS	Plus	RA	Rain (METAR)
PSBL	Possible	RADAT	Radiosonde additional data
PSBLY	Possibly		
PSBLTY	Possibility	RAOB	Radiosonde observation
PSG	Passage		
PSN	Position	RCA	Reach Cruising Altitude
PSND	Positioned		
PTCHY	Patchy	RCH	Reach
PTLY	Partly	RCHD	Reached
PTNL	Potential	RCHG	Reaching
PTNLY	Potentially	RCHS	Reaches
PTNS	Portions	RCKY	Rocky
PUGET	Puget Sound	RCKYS	Rockies
PVA	Positive vorticity advection	RCMD	Recommend
		RCMDD	Recommended
PVL	Prevail	RCMDG	Recommending
PVLD	Prevailed	RCMDS	Recommends
PVLG	Prevailing	RCRD	Record
PVLS	Prevails	RCRDS	Records
PVLT	Prevalent	RCV	Receive
PWB	Pilot weather briefing	RCVD	Received
		RCVG	Receiving
PWINO	Precipitation identifier sensor not available	RCVS	Receives
		RDC	Reduce
		RDGG	Ridging
		RDR	Radar
PWR	Power	RDVLP	Redevelop

RDVLPG	Redeveloping	ROTD	Rotated
RDVLPMT	Redevelopment	ROTG	Rotating
RE	Regard	ROTS	Rotates
RECON	Reconnaissance	RPD	Rapid
REF	Reference	RPDLY	Rapidly
RES	Reserve	RPLC	Replace
REPL	Replace	RPLCD	Replaced
REPLD	Replaced	RPLCG	Replacing
REPLG	Replacing	RPLCS	Replaces
REPLS	Replaces	RPRT	Report
REQ	Request	RPRTD	Reported
REQS	Requests	RPRTG	Reporting
REQSTD	Requested	RPRTS	Reports
RESP	Response	RPT	Repeat
RESTR	Restrict	RPTG	Repeating
RGD	Ragged	RPTS	Repeats
RGL	Regional model	RQR	Require
RGLR	Regular	RQRD	Required
RGN	Region	RQRG	Requiring
RGNS	Regions	RQRS	Requires
RGT	Right	RRx	Code used in the WMO abbreviated heading to indicate a delayed forecast, where x is the letter A through X
RH	Relative humidity		
RHINO	RHI not operative		
RI	Rhode Island		
RIME	Type of icing characterized by a rough, milky, opaque appearance	RS	Receiver station
		RSG	Rising
		RSN	Reason
RIOGD	Rio Grande	RSNG	Reasoning
RLBL	Reliable	RSNS	Reasons
RLTV	Relative	RSTR	Restrict
RLTVLY	Relatively	RSTRD	Restricted
RM	Remarks	RSTRG	Restricting
RMK	Remark	RSTRS	Restricts
RMN	Remain	RTRN	Return
RMND	Remained	RTRND	Returned
RMNDR	Remainder	RTRNG	Returning
RMNG	Remaining	RTRNS	Returns
RMNS	Remains	RUC	Rapid Update Cycle
RNFL	Rainfall	RUF	Rough
RNG	Range	RUFLY	Roughly
ROT	Rotate		

RVR	Runway Visual Range	SEV	Severe
		SEWD	Southeastward
RVRNO	RVR system not available	SFC	Surface
		SFERICS	Atmospherics
RVS	Revise	SG	Snow grains
RVSD	Revised	SGFNT	Significant
RVSG	Revising	SGFNTLY	Significantly
RVSS	Revises	SH	Showers
RW	Rain shower	SHFT	Shift
RWY	Runway	SHFTD	Shifted
RY	Runway	SHFTG	Shifting
S	South	SHFTS	Shifts
SA	Sand (METAR)	SHLD	Shield
SAB	Satellite Analysis Branch	SHLW	Shallow
		SHRT	Short
SAO	Surface observation	SHRTLY	Shortly
SASK	Saskatchewan	SHRTWV	Shortwave
SATFY	Satisfactory	SHUD	Should
SBND	Southbound	SHWR	Shower
SBSD	Subside	SIERNEV	Sierra Nevada
SBSDD	Subsided	SIG	Signature
SBSDNC	Subsidence	SIGMET	Significant meteoro-logical information
SBSDS	Subsides		
SC	South Carolina or stratocumulus	SIMUL	Simultaneous
		SK	Sky cover
SCND	Second	SKC	Sky clear
SCNDRY	Secondary	SKED	Schedule
SCSL	Stratocumulus standing lenticular	SLD	Solid
		SLGT	Slight
SCT	Scatter or Scattered (describing cloud cover or weather phenomena, 3 to 4 octas cloud amount	SLGTLY	Slightly
		SLO	Slow
		SLOLY	Slowly
		SLOR	Slower
		SLP	Slope or sea level pressure
SCTD	Scattered		
SCTR	Sector	SLPG	Sloping
SD	South Dakota	SLPNO	Sea-level pressure not available
SE	Southeast		
SEC	Second	SLT	Sleet
SELY	Southeasterly	SLW	Slow
SEPN	Separation	SLY	Southerly
SEQ	Sequence	SM	Statute mile
SERN	Southeastern		

SMK	Smoke	SRND	Surround
SML	Small	SRNDD	Surrounded
SMLR	Smaller	SRNDG	Surrounding
SMRY	Summary	SRNDS	Surrounds
SMS	Sunchronous mete-orological satellite	SS	Sunset or sand storm (METAR)
SMTH	Smooth	SSE	South-southeast
SMTHR	Smoother	SSELY	South-southeasterly
SMTHST	Smoothest	SSERN	South-southeastern
SMTM	Sometime	SSEWD	South-southeastward
SMWHT	Somewhat	SSW	South-southwest
SN	Snow	SSWLY	South-southwesterly
SNBNK	Snowbank	SSWRN	South-southwestern
SND	Sand	SSWWD	South-southwest-ward
SNFLK	Snowflake		
SNGL	Single	ST	Stratus
SNOINCR	Snow increase	STAGN	Stagnation
SNOINCRG	Snow increasing	STBL	Stable
SNST	Sunset	STBLTY	Stability
SNW	Snow	STD	Standard
SNWFL	Snowfall	STDY	Steady
SOP	Standard operating procedure	STFR	Stratus fractus
		STFRM	Stratiform
SP	Snow pellets	STG	Strong
SPC	Storm Prediction Center	STGLY	Strongly
		STGR	Stronger
SPCLY	Especially	STGST	Strongest
SPD	Speed	STLT	Satellite
SPECI	Special observation	STM	Storm
SPENES	Satellite precip. estimate statement	STMS	Storms
		STN	Station
SPKL	Sprinkle	STNRY	Stationary
SPLNS	Southern Plains	SUB	Substitute
SPRD	Spread	SUBTRPCL	Subtropical
SPRDG	Spreading	SUF	Sufficient
SPRDS	Spreads	SUFLY	Sufficiently
SPRL	Spiral	SUG	Suggest
SQ	Squall	SUGG	Suggesting
SQAL	Squall	SUGS	Suggests
SQLN	Squall line	SUP	Supply
SR	Sunrise	SUPG	Supplying
SRN	Southern		

SUPR	Superior	THKNS	Thickness
SUPSD	Supersede	THKR	Thicker
SUPSDG	Superseding	THKST	Thickest
SUPSDS	Supersedes	THN	Thin
SVG	Serving	THNG	Thinning
SVR	Severe	THNR	Thinner
SVRL	Several	THNST	Thinnest
SW	Southwest	THR	Threshold
SW-	Light snow shower	THRFTR	Thereafter
SW+	Heavy snow shower	THRU	Through
SWD	Southward	THRUT	Throughout
SWLG	Swelling	THSD	Thousand
SWLY	Southwesterly	THTN	Threaten
SWODY1	SPC Severe Weather Outlook for Day 1	THTND	Threatened
		THTNG	Threatening
SWOMCD	SPC Mesoscale discussion	THTNS	Threatens
		TIL	Until
SWRN	Southwestern	TKOF	Takeoff
SWWD	Southwestward	TM	Time
SX	Stability index	TMPRY	Temporary
SXN	Section	TMPRYLY	Temporarily
SYNOP	Synoptic	TMW	Tomorrow
SYNS	Synopsis	TN	Tennessee
SYS	System	TNDCY	Tendency
T	Thunder	TNDCYS	Tendencies
TA	Temperature	TNGT	Tonight
TACAN	UHF Tactical Air Navigation Aid	TNTV	Tentative
		TNTVLY	Tentatively
TAF	Terminal Area Forecast	TOC	Top of Climb
		TOP	Top of Clouds
TB	Turbulence	TOPS	Tops
TCNTL	Transcontinental	TOVC	Top of overcast
TCU	Towering cumulus	TP	Type of aircraft
TDA	Today	TPG	Topping
TEI	Text element indicator	TRBL	Trouble
		TRIB	Tributary
TEMP	Temperature	TRKG	Tracking
TEMPO	Temporary	TRML	Terminal
THD	Thunderhead	TRMT	Terminate
THDR	Thunder	TRMTD	Terminated
THK	Thick	TRMTG	Terminating
THKNG	Thickening		

TRMTS	Terminates		UNAVBL	Unavailable
TRNSP	Transport		UNEC	Unnecessary
TRNSPG	Transporting		UNKN	Unknown
TROF	Trough		UNL	Unlimited
TROFS	Troughs		UNRELBL	Unreliable
TROP	Tropopause		UNRSTD	Unrestricted
TRPCD	Tropical continental air mass		UNSATFY	Unsatisfactory
			UNSBL	Unseasonable
TRPCL	Tropical		UNSTBL	Unstable
TRRN	Terrain		UNSTDY	Unsteady
TRSN	Transition		UNSTL	Unsettle
TRW	Thunderstorm		UNSTLD	Unsettled
TRW+	Thunderstorm with heavy rain shower		UNUSBL	Unusable
TS	Thunderstorm (METAR)		UP	Unknown precipitation (used only by automated sites incapable of discrimination)
TS +	Thunderstorm with heavy snow			
TSFR	Transfer		UPDFTS	Updrafts
TSFRD	Transferred		UPR	Upper
TSFRG	Transferring		UPSLP	Upslope
TSFRS	Transfers		UPSTRM	Upstream
TSHWR	Thundershower		URG	Urgent
TSNO	Thunderstorm information not available		USBL	Usable
			UT	Utah
TSNT	Transient		UTC	Universal Time Coordinate
TSQLS	Thundersquall			
TSTM	Thunderstorm		UUA	Urgent PIREP Weather Reports
TSW	Thunderstorm with snow showers		UVV	Upward vertical velocity
TSW+	Thunderstorm with heavy snow showers		UWNDS	Upper winds
TURBC	Turbulence		V	Varies
TURBT	Turbulent		VA	Virginia or Volcanic Ash
TWD	Toward			
TWDS	Towards		VAAC	Volcanic Ash Advisory Center
TWI	Twilight		VAAS	Volcanic Ash Advisory Statement
TWR	Tower			
TWRG	Towering		VAD	Velocity azimuth display
TX	Texas			
UA	Pilot weather reports		VAL	Valley
UDDF	Up- and downdrafts		VARN	Variation
UN	Unable		VC	Vicinity

Common Weather Abbreviations

VCNTY	Vicinity	VSBYIR	Visibility increasing rapidly
VCOT	VFR conditions on top	VT	Vermont
VCTR	Vector	VV	Vertical velocity or vertical visibility
VCTS	Thunderstorms in the vicinity	VWP	VAD Wind profiler
VDUC	VAS Data Utilization Center (NSSFC)	W	West
VFR	Visual flight rules	WA	Washington
VFY	Verify	WAA	Warm air advection
VFYD	Verified	WAFS	Word Area Forecast System
VFYG	Verifying	WBND	Westbound
VFYS	Verifies	WDLY	Widely
VHF	Very High Frequency	WDSPRD	Widespread
VIS	Visibility	WEA	Weather
VSNO	Visibility at secondary location not available	WFO	Weather Forecast Office
VLCTY	Velocity	WFSO	Weather Forecast Service Office
VLCTYS	Velocities	WFP	Warm front passage
VLNT	Violent	WI	Wisconsin
VLNTLY	Violently	WIBIS	Will be issued
VLY	Valley	WINT	Winter
VMC	Visual meteorological conditions	WK	Weak
VOL	Volume	WKDAY	Weekday
VOR	VHF Omnidirectional Radio Range	WKEND	Weekend
		WKNG	Weakening
		WKNS	Weakens
VORT	Vorticity	WKR	Weaker
VORTAC	VOR and TACAN combination	WKST	Weakest
		WKN	Weaken
VR	Veer	WL	Will
VRB	Variable	WLY	Westerly
VRG	Veering	WMO	World Meteorological Organization
VRBL	Variable		
VRISL	Vancouver Island,BC	WND	Wind
VRS	Veers	WNDS	Winds
VRT MOTN	Vertical motion	WNW	West-northwest
VRY	Very	WNWLY	West-northwesterly
VSB	Visible	WNWRN	West-northwestern
VSBY	Visibility	WNWWD	West-northwest-ward
VSBYDR	Visibility decreasing rapidly	WO	Without

Appendix B
Wx Abbreviations

WPLTO	Western Plateau	XTNDD	Extended
WRM	Warm	XTNDG	Extending
WRMG	Warming	XTRM	Extreme
WRMR	Warmer	XTRMLY	Extremely
WRMST	Warmest	YDA	Yesterday
WRMFNT	Warm front	YKN	Yukon
WRMFNTL	Warm frontal	YLSTN	Yellowstone
WRN	Western	Z	Zulu time
WRNG	Warning	ZL	Freezing drizzle
WRS	Worse	ZN	Zone
WS	Wind shear	ZNS	Zones
WSHFT	Windshift	ZR	Freezing rain
WSFO	Weather Service Forecast Office		
WSO	Weather service office		
WSR-88D	NWS Doppler Radar		
WSTCH	Wasatch Range		
WSW	West-southwest		
WSWLY	West-southwesterly		
WSWRN	West-southwestern		
WSWWD	West-southwest-ward		
WTR	Water		
WTSPT	Waterspout		
WUD	Would		
WV	West Virginia or wind		
WVS	Waves		
WW	Severe weather watch		
WWD	Westward		
WWS	Severe weather watches		
WX	Weather		
WY	Wyoming		
XCP	Except		
XPC	Expect		
XPCD	Expected		
XPCG	Expecting		
XPCS	Expects		
XPLOS	Explosive		
XTND	Extend		

Appendix B
Wx Abbreviations

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APPENDIX C

GPS PRIMER

BACKGROUND

The Global Positioning System (GPS) is a satellite-based navigation system that was originally conceived and implemented by the United States Department of Defense (DoD). The system is, however, available to all civilian users free of charge. GPS provides extremely precise position, velocity, and time information.

The satellites are not geosynchronous, as is the case with many weather and television satellites. That is, each satellite is not above a fixed spot on the Earth all the time, but rather is continuously moving across the sky. In fact, each satellite completely orbits the Earth two times per day.

The Department of Defense has the capability to impose an intentional accuracy degradation of the GPS system. This degradation is known as Selective Availability (SA). When SA is active, only U.S. military users have access to full GPS accuracy. For civilian users, position accuracy is degraded to no worse than 100 meters 95% of the time. At the time of this writing, Selective Availability has been turned off by the DOD but it could be turned back on at another time .

GPS POSITION DETERMINING CONCEPT

The technique used to determine position is fundamentally very simple. The complicated part is accounting for and correcting all the possible errors in the position.

The GPS receiver is able to determine the time it takes a radio signal to travel from the satellite to the GPS antenna. Since this radio signal travels at the speed of light (approximately 186,000 statute miles per second), the time delay can very easily be used to determine the receiver's distance from a given satellite. If measurements are taken from four satellites (or three satellites and an input from an aircraft altimeter), the receiver can identify its position very precisely.

For example, the GPS receiver might determine that it is exactly 12,000 miles from satellite A, 12,700 miles from satellite B, and 13,100 miles from satellite C. At the same time, the aircraft's encoding altimeter might be indicating an altitude of 9,500 feet MSL. There is only one point in space that satisfies these four measurements.

GPS DATA SIGNALS

Two of the primary types of signals that the GPS satellites broadcast are almanac and ephemeris data. These signals enable the GPS receiver to

quickly lock on to the satellites in view. Otherwise, the receiver would have to look for each of the 24 satellites to determine which ones could be used.

Almanac data is very crude data which describes the approximate orbital position of the satellites. Each of the 24 satellites transmits the almanac data for all satellites, so a GPS receiver has only to listen to one satellite in order to know which satellites are "visible" (in the sky) at that particular time. Almanac data is good for about six months, so when you turn the receiver off, then back on a month later, it will know what satellites to look for.

Ephemeris data is very precise data which each satellite transmits to tell the GPS receiver exactly where it is and what its orbital parameters will be for about the next four hours. Each satellite transmits its own unique ephemeris data.

GPS SYSTEM SEGMENTS

The GPS system is composed of three segments: the Space Segment, the Control Segment, and the User Segment.

The Space Segment consists of the 24 NAVSTAR satellites which orbit the earth at an altitude of 10,898 nautical miles. The satellite orbits are very precisely planned so that the entire surface of the earth may use the GPS system 24 hours a day, every day. There are almost always more than six satellites in view from anywhere on Earth.

The Control Segment consists of a network of ground-based monitoring and control stations. The Master Control Station is located in Colorado Springs, Colorado. All satellite data which is collected by the other ground stations is assimilated and analyzed at Colorado Springs. Based on these analyses, ephemeris updates (such as system clock corrections) are sent (uplinked) to the satellites through radio transmitters at the ground stations. These ground stations are located at Kwajalein (west of Hawaii in the central Pacific Ocean), Diego Garcia (in the Indian Ocean), and Ascension (in the south Atlantic Ocean).

As an owner of a GPS system, you can now claim to be a certified member of the GPS User Segment! GPS has many users and uses, and more are being dreamed up all the time. Not only are aircraft using GPS navigation, so are military systems and personnel, boaters, hikers, and surveyors. Personal automobiles and transport trucks use Intelligent Transportation Systems, or ITS, to find their destinations, and track their movements. Some biologists attach GPS receivers to animals to monitor their movement and migration patterns. Geologists even use GPS to track the movement of glaciers and to analyze plate tectonics (movements of the Earth's crust).

APPENDIX D - NAVIGATION TERMS

BRG - Bearing to waypoint (degrees)
DA - Drift Angle (degrees) - (not displayed)
DIS - Distance to waypoint (nm)
DTK - Desired Track (degrees)
ETE - Estimated Time Enroute (hrs:min)
ETA - Estimated Time of Arrival
GS - Groundspeed (nm/hr)
HDG - Heading (degrees)
OBS - Selected Course
POS - Present position
TRK - Actual Track (degrees)
WPT - Waypoint
XTK - Cross Track Error Correction (nm) displayed as "FLY L 2.3 nm" on CDI or HSI.

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Honeywell